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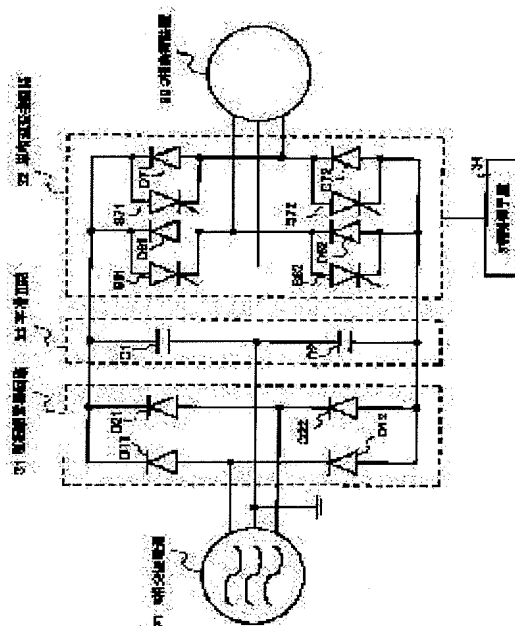
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(54) THREE-PHASE INVERTER

(57)Abstract:

PROBLEM TO BE SOLVED: To suppress leakage current and power source noise, and realize miniaturization and reduction in the number of constituent part items and cost.

SOLUTION: One phase of a three-phase AC power source 21, of which the phase is not connected with a single-phase forward converting circuit 31, is connected with an intermediate connection part of capacitors C1 and C2 of a smoothing circuit 33, and with one phase of a three-phase load 26 which phase is not connected with a single-phase backward converting circuit 32. Thereby DC voltages applied to the capacitors C1 and C2 are fixed to about double the potentials of a line voltage of the three-phase AC power source 21, at a maximum, when a ground potential is set as a reference. The DC voltages are applied to a load 26 via the backward converting circuit 32. The potential of one phase of the load 26 is set at a ground potential, and the instantaneous value of a voltage of the other phase is restrained at about double the potential of the line voltage of the power source 21 at a maximum.



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CLAIMS

[Claim(s)]

[Claim 1]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:

A single phase rectification circuit connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply.

A smoothing circuit which are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply at least, and is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus.

A single phase inversion circuit which is connected to said smoothing circuit and connected to the remaining 2 phase input of said three-phase-circuit load apparatus.

A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus.

[Claim 2]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:

A rate rectification circuit of single phase high tensile which consists of a switch element by which antiparallel connection was carried out to a single phase full bridge rectifier and said single phase full bridge rectifier.

A smoothing circuit which are connected to the direct-current side of said rate rectification circuit of single phase high tensile, and the series connection of the capacitor of a couple is carried out, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply at least, and is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus.

A single phase inversion circuit which is connected to said smoothing circuit and connected to the remaining 2 phase input of said three-phase-circuit load apparatus.

A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus, and a rate rectification control means of high tensile which controls said rate rectification circuit of single phase high tensile to form into an outline sine wave current which flows from said three-phase-alternating-current power supply, and to improve a power-factor.

[Claim 3]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:

A single phase rectification circuit connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply.

Are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply, and. A smoothing circuit which may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means for changing opening and closing of a circuit.

A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus.

When making mostly an output of said three-phase-circuit inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said three-phase-circuit inversion circuit into three-phase-circuit voltage up to the twice [about] of power supply voltage, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means.

[Claim 4]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:

A three-phase-circuit rectification circuit connected to a 3-phase output of a three-phase-alternating-current power supply.

It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, A smoothing circuit which one of the intermediate connection parts of these capacitors may be connected via an opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply, and is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus.

A single phase inversion circuit which is connected to said smoothing circuit and connected to the remaining 2 phase input of said three-phase-circuit load apparatus.

When making an output of said single phase inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage mostly, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said single phase inversion circuit into three-phase-circuit voltage up to 1/about 2 time of power supply voltage, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means.

[Claim 5]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:

A three-phase-circuit rectification circuit connected to a 3-phase output of a three-phase-alternating-current power supply.

It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, One of the intermediate connection parts of these capacitors may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means for changing opening and closing of a circuit, and. A smoothing circuit which may be connected via the 2nd opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply.

A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus.

A keying-circuit control means which controls each switching condition of said 1st opening and

closing means and said 2nd opening and closing means corresponding to an output voltage range of said three-phase-circuit inversion circuit, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said 1st opening and closing means and said 2nd opening and closing means.

[Claim 6]An inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, comprising:

A three-phase-circuit rectification circuit connected to a 3-phase output of a three-phase-alternating-current power supply.

A smoothing circuit where it is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected at a neutral point of said three-phase-alternating-current power supply, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus.

[Claim 7]The three-phase-circuit inverter device according to claim 6, wherein said intermediate connection part of the capacitors of said smoothing circuit is connected also at a neutral point of said three-phase-circuit load apparatus.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the three-phase-circuit inverter device which changes and outputs the voltage and frequency of a three-phase-alternating-current power supply.

[0002]

[Description of the Prior Art]Drawing 11 is a block diagram showing the composition of a common three-phase-circuit inverter device. The three-phase-circuit rectification circuit 11 of composition of that the diode row to which this inverter device carried out the series connection of the diode of a couple was connected to 3 parallel, It has the composition that the three-phase-circuit inversion circuit 12 of composition of that the diode row which carried out the series connection of the diode of a couple was connected to 3 parallel, and antiparallel connection of the switch element was carried out to each one diode of every, and the smoothing capacitor 13 were connected in parallel. Antiparallel connection means that two elements carry out polarity reversely and are connected in parallel.

[0003]In three diode rows of the three-phase-circuit rectification circuit 11, the three phase circuit of the three-phase-alternating-current power supply 21 is supplied to the intermediate connection part of the diode of the couple of each sequence the plane 1 every.

[0004]The output of the three phase circuit of the three-phase-circuit inversion circuit 12 is supplied to each phase of the three-phase-circuit load apparatus 26 the plane 1 every from the intermediate connection part of the diode of the couple of each sequence in three diode rows of the three-phase-circuit inversion circuit 12.

[0005]When the plane 1 of the three-phase-alternating-current power supply 21 is grounded, it is known for the three-phase-circuit inverter device of composition of being shown in drawing 11 that unspecified potential will be impressed to the three-phase-circuit load apparatus 26 to earth potentials. Since it changes with the switch elements in the three-phase-circuit inversion circuit 12 at high speed and the leakage current becomes large with the stray capacitance between the three-phase-circuit load apparatus 26 and earth potentials, the unspecified potential impressed causes [of a power supply noise or leak current] an increase. Therefore, it is preferred to inhibit the influence of the unspecified potential as much as possible. The miniaturization of an inverter device, reduction of component-parts mark, and low cost-ization are also required.

[0006]By the way, in the single phase inverter circuit, the circuit coped with for reducing leak current and a power supply noise is proposed (the Fuji time signal, Vol.71, No.7, p.407-410, 1998). The rate converter circuit 14 of single phase high tensile of composition of this single phase inverter circuit having carried out the series connection of the diode of a couple, as shown in drawing 12, and having carried out antiparallel connection of the switch element to each one diode of every, It has the composition that the single phase inversion circuit 15 of composition of having carried out the series connection of the diode of a couple, and having carried out antiparallel connection of the switch element to each one diode of every and the smoothing circuit 16 which carried out the series connection of the capacitor of a couple were connected

in parallel.

[0007] And one output phases of the two phases of the single-phase alternative current power supply 22, While the intermediate connection part of the diode of the couple of the rate converter circuit 14 of single phase high tensile is supplied via AC reactor 17, the output phases of another side of the single-phase alternative current power supply 22 are supplied to one output phases of the intermediate connection part of the capacitor of the couple of the smoothing circuit 16, and the single phase inversion circuit outputting part 27. The output from the intermediate connection part of the diode of the couple of the single phase inversion circuit 15 is supplied to another output phases of the single phase inversion circuit outputting part 27.

[0008] According to the single phase inverter circuit shown in this drawing 12, both leak current and a power supply noise are controlled, and it is supposed that the effect that reduction of a miniaturization and component-parts mark and low cost-ization are further realizable will be acquired.

[0009]

[Problem(s) to be Solved by the Invention] However, it is still difficult to realize control of leak current, and control of a power supply noise like the single phase inverter circuit mentioned above in a three-phase-circuit inverter device, and it also difficult to fill the demand of the miniaturization of an inverter device, reduction of component-parts mark, low-cost-izing, etc.

[0010] This invention was made in view of the above-mentioned situation, and controls leak current and a power supply noise in a three-phase-circuit inverter device, and an object of this invention is to obtain the three-phase-circuit inverter device which can realize reduction of a miniaturization and component-parts mark, and low cost-ization further.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, on the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a single phase rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, Are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply, and. A single phase inversion circuit which is connected to a smoothing circuit connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and said smoothing circuit, and is connected to the remaining 2 phase input of said three-phase-circuit load apparatus, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus is provided.

[0012] According to this invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, and a single phase inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus.

[0013] This invention is an inverter device which changes both voltage of a three-phase-alternating-current power supply, and both [one side or], and is outputted to a three-phase-circuit load apparatus, A rate rectification circuit of single phase high tensile which consists of a switch element by which antiparallel connection was carried out to a single phase full bridge rectifier and said single phase full bridge rectifier, Are connected to the direct-current side of said rate rectification circuit of single phase high tensile, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-

current power supply, and. A single phase inversion circuit which is connected to a smoothing circuit connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and said smoothing circuit, and is connected to the remaining 2 phase input of said three-phase-circuit load apparatus, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus, and a rate rectification control means of high tensile which controls said rate rectification circuit of single phase high tensile to form into an outline sine wave current which flows from said three-phase-alternating-current power supply, and to improve a power-factor are provided.

[0014]According to this invention, a rate rectification circuit of single phase high tensile consists of a switch element by which antiparallel connection was carried out to a single phase full bridge rectifier and said single phase full bridge rectifier, One of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, is connected to the remaining 2 phase input of a three-phase-circuit load apparatus by single phase inversion circuit, and by a three-phase-circuit control means. A single phase inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus, and a rate rectification circuit of single phase high tensile is controlled so that current which flows from a three-phase-alternating-current power supply is formed into an outline sine wave by rate rectification control means of high tensile and a power-factor is further improved by it.

[0015]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a single phase rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, Are connected to the direct-current side of said single phase rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected to the remaining plane 1 output of said three-phase-alternating-current power supply, and. A smoothing circuit which may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means for changing opening and closing of a circuit, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus, When making mostly an output of said three-phase-circuit inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said three-phase-circuit inversion circuit into three-phase-circuit voltage up to the twice [about] of power supply voltage, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means is provided.

[0016]According to this invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means, It is connected to a three-phase-circuit input of a three-phase-circuit load apparatus, and a three-phase-circuit inversion circuit by a keying-circuit control means an opening and closing means, When making an output of a three-phase-circuit inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage mostly, it will be in a closed circuit state, It is controlled to be in an open state, when making an output of a three-phase-circuit inversion circuit into three-phase-circuit voltage up to the twice [about] of power supply voltage, and further, a three-phase-circuit inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a

three-phase-circuit load apparatus corresponding to a switching condition of an opening and closing means.

[0017]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a three-phase-circuit rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to a 3-phase output of a three-phase-alternating-current power supply, It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, One of the intermediate connection parts of these capacitors may be connected via an opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply, and. A single phase inversion circuit which is connected to a smoothing circuit connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and said smoothing circuit, and is connected to the remaining 2 phase input of said three-phase-circuit load apparatus, When making an output of said single phase inversion circuit into power supply voltage with three-phase-circuit voltage to the voltage mostly, it changes into a closed circuit state, A keying-circuit control means which controls said opening and closing means to consider it as an open state when making an output of said single phase inversion circuit into three-phase-circuit voltage up to 1/about 2 time of power supply voltage, A three-phase-circuit control means which controls said single phase inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said opening and closing means is provided.

[0018]According to this invention, a three-phase-circuit rectification circuit is connected to a 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to a plane 1 output of a three-phase-alternating-current power supply via an opening and closing means, and. It is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, When an opening and closing means makes an output of a single phase inversion circuit power supply voltage with three-phase-circuit voltage to the voltage mostly by a keying-circuit control means, it will be in a closed circuit state, It is controlled to be in an open state, when making an output of a single phase inversion circuit into three-phase-circuit voltage up to 1/about 2 time of power supply voltage, and further, a single phase inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to a switching condition of an opening and closing means.

[0019]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a three-phase-circuit rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to a 3-phase output of a three-phase-alternating-current power supply, It is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, One of the intermediate connection parts of these capacitors may be connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means for changing opening and closing of a circuit, and. A smoothing circuit which may be connected via the 2nd opening and closing means for changing opening and closing of a circuit to a plane 1 output of said three-phase-alternating-current power supply, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus, A keying-circuit control means which controls each switching condition of said 1st opening and closing means and said 2nd opening and closing means corresponding to an output voltage range of said three-phase-circuit inversion circuit, A three-phase-circuit control means which controls said three-phase-circuit inversion circuit to supply 3-phase alternating-current voltage to said three-phase-circuit load apparatus corresponding to a switching condition of said 1st opening and closing means and said 2nd opening and closing means is provided.

[0020]According to this invention, a three-phase-circuit rectification circuit is connected to a 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to a plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means, and. It is connected to a plane 1 output of a three-phase-alternating-current power supply via the 2nd opening and closing means, is connected to a three-phase-circuit input of a three-phase-circuit load apparatus by three-phase-circuit inversion circuit, and by a keying-circuit control means. Corresponding to an output voltage range of a three-phase-circuit inversion circuit, each switching condition of the 1st opening and closing means and the 2nd opening and closing means is controlled, and further by a three-phase-circuit control means. A three-phase-circuit inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to a switching condition of the 1st opening and closing means and the 2nd opening and closing means.

[0021]On the other hand, voltage of a three-phase-alternating-current power supply and frequency this invention Or a three-phase-circuit rectification circuit which is an inverter device which changes both and is outputted to a three-phase-circuit load apparatus, and is connected to a 3-phase output of a three-phase-alternating-current power supply, A smoothing circuit where it is connected to the direct-current side of said three-phase-circuit rectification circuit, and the series connection of the capacitor of a couple is carried out at least, and one of the intermediate connection parts of these capacitors is connected at a neutral point of said three-phase-alternating-current power supply, A three-phase-circuit inversion circuit which is connected to said smoothing circuit and connected to a three-phase-circuit input of said three-phase-circuit load apparatus is provided.

[0022]According to this invention, a three-phase-circuit rectification circuit is connected to a 3-phase output of a three-phase-alternating-current power supply, one of the intermediate connection parts of the capacitors of a smoothing circuit is connected at a neutral point of a three-phase-alternating-current power supply, and a three-phase-circuit inversion circuit is connected to a three-phase-circuit input of a three-phase-circuit load apparatus.

[0023]In this invention, said intermediate connection part of the capacitors of said smoothing circuit may be connected also at a neutral point of said three-phase-circuit load apparatus.

[0024]According to this invention, an intermediate connection part of the capacitors of a smoothing circuit is connected also at a neutral point of a three-phase-circuit load apparatus.

[0025]

[Embodiment of the Invention]Hereafter, with reference to an accompanying drawing, the embodiment of the three-phase-circuit inverter device concerning this invention is described in detail.

[0026]Embodiment 1. drawing 1 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 1. The single phase rectification circuit 31 of composition of that the diode row which, as for this inverter device, carried out the series connection of the diode D11 of a couple, the diode D21 of the diode row which carried out the series connection of D12, and a couple, and D22 was connected in parallel, The diode D61 of a couple, the diode row which carried out the series connection of D62, and the diode D71 of a couple and the diode row which carried out the series connection of D72 are connected in parallel, And it has the composition that the single phase inversion circuit 32 of composition of that antiparallel connection of the switch element S61, S62, S71, and S72 was carried out to each diode D61, D62, D71, and one Devery72, and the capacitor C1 of a couple and the smoothing circuit 33 which carried out the series connection of C2 were connected in parallel.

[0027]In two diode rows of the single phase rectification circuit 31, two phases of the three phase circuits of the three-phase-alternating-current power supply 21 are supplied to the intermediate connection part of the diode D11 and the diode D12, and the intermediate connection part of the diode D21 and the diode D22 the plane 1 every. The remaining plane 1 of the three-phase-alternating-current power supply 21 is grounded, and is supplied to the plane 1 of the inputs of the intermediate connection part of the capacitor C1 of the smoothing circuit

33, and the capacitor C2, and the three phase circuit of the three-phase-circuit load apparatus 26. The output from the intermediate connection part of the diode D61 of the single phase inversion circuit 32 and the diode D62 and the output from the intermediate connection part of the diode D71 and the diode D72 are supplied to the two remaining phases of an input of the three-phase-circuit load apparatus 26, respectively.

[0028]The single phase inversion circuit 32 is controlled by the three-phase-circuit control means 34. The three-phase-circuit control means 34 is a means for controlling to supply 3-phase alternating-current voltage to the three-phase-circuit load apparatus 26.

[0029]An operation of Embodiment 1 is explained below. The plane 1 which is not connected to the single phase rectification circuit 31 of the three-phase-alternating-current power supply 21 is connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2, The about [abbreviation root2 time] potential of the line voltage of the three-phase-alternating-current power supply 21 is impressed between both the capacitors C1 of the smoothing circuit 33, and each two poles of C2. The output of the plane 1 of the single phase inversion circuit 32 is controlled by the three-phase-circuit control means 34 to the output from the intermediate connection part of the smoothing circuit 33, and voltage VRS which has a desired pressure value and frequency between line of the three-phase-circuit load apparatus 26 by it is impressed.

[0030]The output of the remaining plane 1 of the single phase inversion circuit 32 is controlled by the three-phase-circuit control means 34 to the output from the intermediate connection part of the smoothing circuit 33, and the voltage VST from which 120 degrees of phases differ to voltage VRS among other lines of the three-phase-circuit load apparatus 26 by it is impressed. With voltage VRS and the voltage VST, since the remaining voltage VTRs become settled automatically, a three-phase-alternating-current output can be obtained as the composition of the single phase inversion circuit 32 is also.

[0031]According to the Embodiment 1, an unconnected plane 1 in the single phase rectification circuit 31 of the three-phase-alternating-current power supply 21, Since it is connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 and is connected to the plane 1 which is not connected to the single phase inversion circuit 32 of the three-phase-circuit load apparatus 26, The capacitor C1 and the direct current voltage impressed to C2, respectively, Since it is fixed to the about [abbreviation root2 time] potential of the line voltage of the three-phase-alternating-current power supply 21 at the maximum on the basis of earth potentials and the direct current voltage is impressed to the three-phase-circuit load apparatus 26 through the three-phase-circuit inversion circuit 32, Potential of the plane 1 of the three-phase-circuit load apparatus 26 can be made into earth potentials, and the instantaneous value of the voltage of other phases can be controlled at the maximum to the about [abbreviation root2 time] potential of the line voltage of the three-phase-alternating-current power supply 21. As a result, leak current and a power supply noise can be controlled.

[0032]According to the Embodiment 1, like the single phase rectification circuit where the composition of the rectification circuit 31 is common, since the composition of the inversion circuit 32 is the same as that of a general single phase inversion circuit, the miniaturization of an inverter device, reduction of component-parts mark, and low cost-ization are attained.

Furthermore, a loss can also be reduced with reduction of component-parts mark.

[0033]An AC reactor and a direct current reactor may be arbitrarily combined with the inverter device of the above-mentioned composition, the power-factor of a power supply can be improved, and the harmonic content of current can be controlled.

[0034]Embodiment 2. drawing 2 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 2. That this inverter device differs from the above-mentioned Embodiment 1, It is having formed the rate rectification circuit 41 of single phase high tensile instead of the single phase rectification circuit 31, having connected AC reactors 42 and 43 to the three-phase-alternating-current power supply 21 side of the rate rectification circuit 41 of single phase high tensile, respectively, and having established the rate rectification control means 44 of high tensile which controls the rate rectification circuit 41 of single phase high tensile. Since other composition is the same as that

of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.

[0035]The rectifier sequence to which, as for the rate rectification circuit 41 of single phase high tensile, the series connection of the single phase full bridge rectifier D111 of a couple, the single phase full bridge rectifier D121 of the rectifier sequence which carried out the series connection of D112, and a couple, and D122 was carried out is connected in parallel, And it has the composition that antiparallel connection of the switch element S111, S112, S121, and S122 was carried out to each single phase full bridge rectifier D111, D112, D121, and one Devery122.

[0036]The rate rectification control means 44 of high tensile forms into an outline sine wave the current which flows from the three-phase-alternating-current power supply 21, and controls the rate rectification circuit 41 of single phase high tensile to make power factor improvement possible.

[0037]An operation of Embodiment 2 is explained below. Voltage VRS_conv which has a desired pressure value and frequency occurs between the plane 1 output inside the rate rectification circuit 41 of single phase high tensile, and the phase connected to the intermediate junction of the capacitor C1 of the smoothing circuit 33 of the three-phase-alternating-current power supply 21, and the capacitor C2. This voltage VRS_conv is impressed between AC reactors to power supply phase voltage VRS, and the power supply current which flows by it is decided. Therefore, the rate rectification circuit 41 of single phase high tensile is controlled by the rate rectification control means 44 of high tensile, power supply current is formed into an outline sine wave, and voltage VRS_conv which can improve a power-factor is generated.

[0038]Also about between other plane 1 outputs inside the rate rectification circuit 41 of single phase high tensile, and the phases connected to the intermediate junction of the capacitor C1 and the capacitor C2 of the three-phase-alternating-current power supply 21. The rate rectification control means 44 of high tensile performs same control, power supply current is formed into an outline sine wave, and voltage VST_conv which can improve a power-factor is generated.

[0039]Since it is the same as that of Embodiment 1 about control of the inversion circuit 32, explanation is omitted.

[0040]The same effect as Embodiment 1, i.e., control of leak current, according to the Embodiment 2, Control of a power supply noise, the miniaturization of an inverter device, reduction of component-parts mark, the effect that low-cost-izing and reduction of a loss are possible is acquired -- in addition, the rate rectification circuit 41 of single phase high tensile was used as a rectification circuit of the three-phase-alternating-current power supply 21 -- a sake -- from the three-phase-alternating-current power supply 21 -- flowing -- current -- an outline -- a sine wave ---izing -- a power-factor -- being improvable -- saying -- an effect -- obtaining -- having .

[0041]Embodiment 3. drawing 3 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 3. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit inversion circuit 52 instead of the single phase inversion circuit 32, and the output of the three phase circuit of the three-phase-circuit inversion circuit 52 a plane 1 every to each phase of the three-phase-circuit load apparatus 26 It was made to supply. The intermediate connection part of the capacitor C1 of the smoothing circuit 33 and the capacitor C2 was connected via the opening and closing means 54 of a switch etc. at the output point of the plane 1 portion of the three-phase-circuit inversion circuit 52, It is having established the keying-circuit control means 55 which controls opening and closing of the opening and closing means 54, and having established the three-phase-circuit control means 56 for controlling the three-phase-circuit inversion circuit 52. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.

[0042]The diode row which, as for the three-phase-circuit inversion circuit 52, carried out the series connection of the diode D281 of a couple and D282 to the diode D261 of a couple, the diode row which carried out the series connection of D262, and the diode D271 of a couple and

the diode row which carried out the series connection of D272 is connected in parallel, And it has the composition that antiparallel connection of the switch element S261, S262, S271, S272, S281, and S282 was carried out to each diode D261, D262, D271, D272, D281, and one Devery282. The output of the three phase circuit, of the three-phase-circuit inversion circuit 52 is supplied to each phase of the three-phase-circuit load apparatus 26 the plane 1 every from the intermediate connection part of the diode of the couple of each diode row.

[0043]To the opening and closing means 54, the keying-circuit control means 55 is changed into a closed circuit state, when making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the three-phase-circuit inversion circuit 52, and it is controlled to consider it as an open state, in carrying out output possible voltage of said three-phase-circuit inversion circuit 10 to to the twice [about] of power supply voltage.

[0044]The three-phase-circuit control means 56 is controlled to the three-phase-circuit inversion circuit 52 to supply 3-phase alternating-current voltage to the three-phase-circuit load apparatus 26 according to the switching condition of the opening and closing means 54.

[0045]Drawing 4 is a flow chart for explaining operation of the inverter device of Embodiment 3. It is judged first whether the range of the output voltage V_{out} of the three-phase-circuit inversion circuit 52 is larger than the line voltage V_{in} of the three-phase-alternating-current power supply 21 (Step S1). And when you need the output voltage more than the line voltage V_{in} of the three-phase-alternating-current power supply 21 when V_{out} is more than V_{in} namely, The opening and closing means 54 is made into an opened state, and connection between the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S2).

[0046]The three-phase-circuit arm of the three-phase-circuit inversion circuit 52 is controlled by the state by the three-phase-circuit control means 56, respectively, and switching control of the phase voltage of each output phases of the three-phase-circuit inversion circuit 52 is carried out with the line voltage about $2\sqrt{2}$ twice the voltage of a three phase circuit which is the potential by the side of the high tension to the low-voltage side of the smoothing circuit 33 (Step S3). By it, 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0047]On the other hand, when you need output voltage smaller than the line voltage V_{in} of the three-phase-alternating-current power supply 21 at Step S1 when V_{out} is smaller than V_{in} namely, The opening and closing means 54 is made into a closed state, and the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 are connected (step S4). And the three-phase-circuit control means 56 is controlled about two phases which are not connected to the capacitor C1 of the smoothing circuit 33 in the three-phase-circuit inversion circuit 52, and the intermediate connection part of C2 to be able to realize the same control as the above-mentioned Embodiment 1 (Step S5), and a series of control is ended.

[0048]The switching condition of the opening and closing means 54 that according to the Embodiment 3 the opening and closing means 54 for changing the output voltage from the three-phase-circuit inversion circuit 52 is established, and it was made to carry out switching control A sake, The output from the three-phase-circuit inversion circuit 52 can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with power supply voltage. And in making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the three-phase-circuit inversion circuit 52, the effect that control of the same effect as the above-mentioned Embodiment 1, i.e., leak current, control of a power supply noise, the miniaturization of an inverter device, reduction of component-parts mark, low-cost-izing, and reduction of a loss are possible is acquired.

[0049]Embodiment 4. drawing 5 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 4. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit rectification circuit 61 instead of the single phase rectification circuit 31, and the 3-phase output of the three-phase-alternating-current power supply 21 a plane 1 every to the three phase circuit of

the three-phase-circuit rectification circuit 61 It was made to supply. It is having connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 the plane 1 by which it was grounded of the three phase circuits of the three-phase-alternating-current power supply 21 via the opening and closing means 64 of a switch etc., and having established the keying-circuit control means 65 which controls opening and closing of the opening and closing means 64. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.

[0050]The three-phase-circuit rectification circuit 61 has the composition that the diode D311 of a couple, the diode row which carried out the series connection of D312, the diode D321 of a couple and the diode row which carried out the series connection of D322, and the diode D331 of a couple and the diode row which carried out the series connection of D332 were connected in parallel. The output of the three-phase-alternating-current power supply 21 is supplied to the intermediate connection part of the diode of the couple of each diode row a plane 1 every.

[0051]To the opening and closing means 64, the keying-circuit control means 65 is made into an open state, when outputting the three-phase-circuit voltage to $1(1/2)/$ about 2 of power supply voltage to the three-phase-circuit load apparatus 26, and it is controlled to change into a closed circuit state, in carrying out mostly output possible voltage to the three-phase-circuit load apparatus 26 to the voltage with power supply voltage.

[0052]Drawing 6 is a flow chart for explaining operation of the inverter device of Embodiment 4. It is judged first whether the range of the output voltage V_{out} of the single phase inversion circuit 32 is larger than the line voltage V_{in} of the three-phase-alternating-current power supply 21 (Step S11). And when V_{out} needs the output voltage to the voltage mostly with the line voltage V_{in} of the time 21 to the almost same voltage as V_{in} , i.e., a three-phase-alternating-current power supply, The opening and closing means 64 is made into a closed state, and the plane 1 arm in the three-phase-circuit rectification circuit 61, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 are connected (Step S12). The three-phase-circuit control means 34 performs the same control as the above-mentioned Embodiment 1 to the single phase inversion circuit 32 in the state (Step S14), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0053]When V_{out} is at Step S11 on the other hand to one $1(1/2)/$ about 2 twice the voltage of V_{in} , Namely, when you need the output voltage up to $1(1/2)/$ about 2 time of the line voltage V_{in} of the three-phase-alternating-current power supply 21, The opening and closing means 64 is made into an opened state, connection between the plane 1 arm in the three-phase-circuit rectification circuit 61, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S13), it progresses to Step S14, 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0054]The switching condition of the opening and closing means 64 that according to the Embodiment 4 the opening and closing means 64 for changing the output voltage from the single phase inversion circuit 32 is established, and it was made to carry out switching control A sake, The output from the single phase inversion circuit 32 can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to $1(1/2)/$ about 2 time of power supply voltage with power supply voltage. And in making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the single phase inversion circuit 32, the effect that control of the same effect as the above-mentioned Embodiment 1, i.e., leak current, control of a power supply noise, the miniaturization of an inverter device, reduction of component-parts mark, low-cost-izing, and reduction of a loss are possible is acquired.

[0055]In making the three-phase-circuit voltage from the single phase inversion circuit 32 to $1(1/2)/$ about 2 time of power supply voltage output, since the voltage change by switching will be $1(1/2)/$ about 2 time, a bigger effect is acquired to leak current and power supply noise control - in addition, the rate of a carrier frequency component over output voltage is controlled, and the ripple component of current and the quasistable state of load can be controlled.

[0056] Embodiment 5. drawing 7 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 5. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit rectification circuit 61 instead of the single phase rectification circuit 31, and the 3-phase output of the three-phase-alternating-current power supply 21 a plane 1 every to the three phase circuit of the three-phase-circuit rectification circuit 61 It was made to supply. Form the three-phase-circuit inversion circuit 52 instead of the single phase inversion circuit 32, and the output of the three phase circuit of the three-phase-circuit inversion circuit 52 a plane 1 every to each phase of the three-phase-circuit load apparatus 26 It was made to supply. The intermediate connection part of the capacitor C1 of the smoothing circuit 33 and the capacitor C2 was connected via the 1st opening and closing means 54 of a switch etc. at the output point of the plane 1 portion of the three-phase-circuit inversion circuit 52, The plane 1 by which it was grounded of the three phase circuits of the three-phase-alternating-current power supply 21 was connected to the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 via the 2nd opening and closing means 64 of a switch etc., It is having established the 1st keying-circuit control means 55 and the 2nd keying-circuit control means 65 which control opening and closing of the 1st opening and closing means 54 and the 2nd opening and closing means 64, respectively, and having established the three-phase-circuit control means 56 for controlling the three-phase-circuit inversion circuit 52. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.

[0057] The three-phase-circuit inversion circuit 52, the 1st opening and closing means 54, the 1st keying-circuit control means 55, and the three-phase-circuit control means 56 are the things of the same composition as the three-phase-circuit inversion circuit 52 of Embodiment 3 shown in drawing 3, respectively, the opening and closing means 54, the keying-circuit control means 55, and the three-phase-circuit control means 56. Therefore, since it overlaps, these circuits and explanation of each means are omitted.

[0058] The three-phase-circuit rectification circuit 61, the 2nd opening and closing means 64, and the 2nd keying-circuit control means 65 are the things of the same composition as the three-phase-circuit rectification circuit 61 of Embodiment 4 shown in drawing 5, respectively, the opening and closing means 64, and the keying-circuit control means 65. Therefore, since it overlaps, these circuits and explanation of each means are omitted.

[0059] Drawing 8 is a flow chart for explaining operation of the inverter device of Embodiment 5. It is judged first whether the range of the output voltage V_{out} of the three-phase-circuit inversion circuit 52 is larger than the line voltage V_{in} of the three-phase-alternating-current power supply 21 (Step S21). And when you need the output voltage up to the twice [about] of the line voltage V_{in} of the three-phase-alternating-current power supply 21 when V_{out} is more than V_{in} namely, The 2nd opening and closing means 64 is changed into a closed circuit state by the 2nd keying-circuit control means 65, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 are connected to the three-phase-alternating-current power supply 21 (Step S22).

[0060] And the 1st opening and closing means 54 is made into an open state by the 1st keying-circuit control means 55, and connection between the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S23). The three-phase-circuit arm of the three-phase-circuit inversion circuit 52 is controlled by the state by the three-phase-circuit control means 56, respectively, Switching control of the phase voltage of each output phases of the three-phase-circuit inversion circuit 52 is carried out with the line voltage about $2\sqrt{2}$ twice the voltage of a three phase circuit which is the potential by the side of the high tension to the low-voltage side of the smoothing circuit 33 (Step S24), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0061] On the other hand, when you need output voltage smaller than the line voltage V_{in} of the three-phase-alternating-current power supply 21 at Step S21 when V_{out} is smaller than V_{in} namely, it judges whether V_{out} is $1(1/2)/$ about 2 twice the V_{in} (Step S25). When V_{out} is 1

(1/2)/about 2 twice the V_{in} , it is judged whether the three-phase-circuit balance of the current of the three-phase-alternating-current power supply 21 is thought further as important (Step S26).

[0062]In thinking a three-phase-circuit balance as important at Step S26, the 2nd opening and closing means 64 is made into an open state by the 2nd keying-circuit control means 65, and it intercepts connection with the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 and the three-phase-alternating-current power supply 21 (Step S27). And the 1st opening and closing means 54 is made into an open state by the 1st keying-circuit control means 55, and connection between the plane 1 arm in the three-phase-circuit inversion circuit 52, and the capacitor C1 of the smoothing circuit 33 and the intermediate connection part of C2 is intercepted (Step S28).

[0063]The three-phase-circuit arm of the three-phase-circuit inversion circuit 52 is controlled by the state by the three-phase-circuit control means 56, respectively, Switching control of the phase voltage of each output phases of the three-phase-circuit inversion circuit 52 is carried out with the line voltage twice [abbreviation root2] the voltage of a three phase circuit which is the potential by the side of the high tension to the low-voltage side of the smoothing circuit 33 (Step S29), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0064]In thinking as important control of leak current and a power supply noise, without thinking a three-phase-circuit balance as important at Step S26, the 2nd opening and closing means 64 is changed into a closed circuit state by the 2nd keying-circuit control means 65, and it connects the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 to the three-phase-alternating-current power supply 21 (Step S30). And the 1st opening and closing means 54 is changed into a closed circuit state by the 1st keying-circuit control means 55, and the plane 1 arm in the three-phase-circuit inversion circuit 52 is connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 (Step S31). By the three-phase-circuit control means 56, about two phases which are not connected to the capacitor C1 of the smoothing circuit 33 in the three-phase-circuit inversion circuit 52, and the intermediate connection part of C2 in the state, The same control as the above-mentioned Embodiment 1 is performed (Step S32), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0065]When V_{out} is not $1(1/2)/$ about 2 twice the V_{in} at Step S25, the 2nd opening and closing means 64 is made into an open state by the 2nd keying-circuit control means 65, and connection with the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 and the three-phase-alternating-current power supply 21 is intercepted (Step S33). And the 1st opening and closing means 54 is changed into a closed circuit state by the 1st keying-circuit control means 55, and the plane 1 arm in the three-phase-circuit inversion circuit 52 is connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 (Step S34). By the three-phase-circuit control means 56, about two phases which are not connected to the capacitor C1 of the smoothing circuit 33 in the three-phase-circuit inversion circuit 52, and the intermediate connection part of C2 in the state, The same control as the above-mentioned Embodiment 1 is performed (Step S35), 3-phase alternating-current voltage is impressed to the three-phase-circuit load apparatus 26, and a series of control is ended.

[0066]According to the Embodiment 5, the 1st opening and closing means 54 and 2nd opening and closing means 64 for changing the output voltage from the three-phase-circuit inversion circuit 52 are established, The switching condition of these 1st and 2nd opening and closing means 54 and 64 that it was made to carry out switching control A sake, The output from the three-phase-circuit inversion circuit 52 can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with the three-phase-circuit voltage up to $1(1/2)/$ about 2 time of power supply voltage, and power supply voltage. And in making the three-phase-circuit voltage to the voltage output mostly with power supply voltage from the three-phase-circuit inversion circuit 52, the effect that control of the same effect as the above-mentioned Embodiment 1, i.e., leak current, control of a power supply noise, the miniaturization of an inverter device, reduction of

component-parts mark, low-cost-izing, and reduction of a loss are possible is acquired.

[0067]In making the three-phase-circuit voltage from the three-phase-circuit inversion circuit 52 to $1(1/2)/\text{about } 2$ time of power supply voltage output, since the voltage change by switching will be $1(1/2)/\text{about } 2$ time, a bigger effect is acquired to leak current and power supply noise control -- in addition, the rate of a carrier frequency component over output voltage is controlled, and the ripple component of current and the quasistable state of load can be controlled.

[0068]Embodiment 6. drawing 9 is a block diagram showing the composition of the three-phase-circuit inverter device concerning the embodiment of the invention 6. That this inverter device differs from the above-mentioned Embodiment 1, Form the three-phase-circuit rectification circuit 61 instead of having replaced with the three-phase-alternating-current power supply 21, and having used the three-phase-circuit Y connection power supply 23, and the single phase rectification circuit 31, and the 3-phase output of a three-phase-circuit Y connection power supply a plane 1 every to the three phase circuit of the three-phase-circuit rectification circuit 61 It was made to supply. The three-phase-circuit inversion circuit 52 is formed instead of the single phase inversion circuit 32, and it is having made it supply and having connected the intermediate connection part of the capacitor C1 of the smoothing circuit 33, and the capacitor C2 at the neutral point of the three-phase-circuit Y connection power supply a plane 1 every at each phase of the three-phase-circuit load apparatus 26 about the output of the three phase circuit of the three-phase-circuit inversion circuit 52. Since other composition is the same as that of the above-mentioned Embodiment 1 (refer to drawing 1), the numerals same about the same composition are attached and explanation is omitted.

[0069]The three-phase-circuit inversion circuit 52 and the three-phase-circuit rectification circuit 61 are the things of the same composition as the three-phase-circuit inversion circuit 52 of Embodiment 3 shown in drawing 3, respectively, and the three-phase-circuit rectification circuit 61 of Embodiment 4 shown in drawing 5. Therefore, since it overlaps, explanation of those circuits is omitted.

[0070]An operation of Embodiment 6 is explained below. The voltage between a node with the three-phase-circuit Y connection power supply 23 of the smoothing circuit 33 and the higher rank potential side of the smoothing circuit 33 becomes twice [abbreviation root2] a phase voltage effective value of the three-phase-circuit Y connection power supply 23. The voltage between a node with the three-phase-circuit Y connection power supply 23 of the smoothing circuit 33 and the low rank potential side of the smoothing circuit 33 becomes twice [abbreviation root2] a phase voltage effective value of the three-phase-circuit Y connection power supply 23 similarly. Therefore, the direct current voltage impressed to the three-phase-circuit inversion circuit 52 will become by about $2\text{root}2$ twice the phase voltage effective value of the three-phase-circuit Y connection power supply 23, and the output voltage effective value between sinusoidal wave output lines of the three-phase-circuit inversion circuit 52 will be the abbreviation root3 time of the phase voltage effective value of the three-phase-circuit Y connection power supply 23.

[0071]In not connecting the neutral point of the three-phase-circuit Y connection power supply 23 to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 to it, The direct current voltage impressed to the three-phase-circuit inversion circuit 52 will be the abbreviation root6 time of the phase voltage effective value of the three-phase-circuit Y connection power supply 23, and the output voltage effective value between sinusoidal wave output lines of the three-phase-circuit inversion circuit 52 is up to about $3(3/2)/2$ time of a phase voltage effective value. Therefore, output voltage increases about 15% by having connected the neutral point of the three-phase-circuit Y connection power supply 23 to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2.

[0072]Since the neutral point of the three-phase-circuit Y connection power supply 23 was connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 according to the Embodiment 6, Since the instant voltage to the earth potentials which can increase and are further impressed to the three-phase-circuit load apparatus 26 can also control the output of the three-phase-circuit inversion circuit 52, leak current and a power

supply noise can be controlled.

[0073] Like the modification shown in drawing 10, it may replace with the three-phase-circuit load apparatus 26, and both the neutral point of the three-phase-circuit Y connection load apparatus 28 and the neutral point of the three-phase-circuit Y connection power supply 23 may be connected to the capacitor C1 of the smoothing circuit 33, and the intermediate connection part of C2 using the three-phase-circuit Y connection load apparatus 28. Since the neutral point potential of the three-phase-circuit Y connection load apparatus 28 will be stabilized in addition to the output enhancement effect of the three-phase-circuit inversion circuit 52, and the depressor effect of the instant voltage to the earth potentials impressed to the three-phase-circuit Y connection load apparatus 28 if it does in this way, leak current and a power supply noise can be controlled further.

[0074]

[Effect of the Invention] As mentioned above, according to this invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply as explained, and. Since it is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, and a single phase inversion circuit is controlled by a three-phase-circuit control means so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus, Potential of the plane 1 of a three-phase-circuit load apparatus can be made into earth potentials, and the instantaneous value of the voltage of other phases can be controlled at the maximum to the about [abbreviation root2 time] potential of the line voltage of a three-phase-alternating-current power supply. As a result, leak current and a power supply noise can be controlled. Since a general single phase rectification circuit and a general single phase inversion circuit can be used, the miniaturization of an inverter device, reduction of component-parts mark, and low cost-ization are attained. Furthermore, a loss can also be reduced with reduction of component-parts mark.

[0075] According to the next invention, the rate rectification circuit of single phase high tensile consists of a switch element by which antiparallel connection was carried out to the single phase full bridge rectifier and said single phase full bridge rectifier, One of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, is connected to the remaining 2 phase input of a three-phase-circuit load apparatus by the single phase inversion circuit, and by a three-phase-circuit control means. A single phase inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus, and further by the rate rectification control means of high tensile. Since the rate rectification circuit of single phase high tensile is controlled so that the current which flows from a three-phase-alternating-current power supply is formed into an outline sine wave and a power-factor is improved, the current which flows from a three-phase-alternating-current power supply can be formed into an outline sine wave, and a power-factor can be improved.

[0076] According to the next invention, a single phase rectification circuit is connected to two phases of the 3-phase outputs of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the remaining plane 1 output of a three-phase-alternating-current power supply, and. It is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via an opening and closing means, It is connected to the three-phase-circuit input of a three-phase-circuit load apparatus, and a three-phase-circuit inversion circuit by a keying-circuit control means an opening and closing means, When making the output of a three-phase-circuit inversion circuit into power supply voltage with the three-phase-circuit voltage to the voltage mostly, it will be in a closed circuit state, It is controlled to be in an open state, when making the output of a three-phase-circuit inversion circuit into the three-phase-circuit voltage up to the twice

[about] of power supply voltage, and further by a three-phase-circuit control means. Since a three-phase-circuit inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to the switching condition of an opening and closing means, the output from a three-phase-circuit inversion circuit can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with power supply voltage.

[0077]According to the next invention, a three-phase-circuit rectification circuit is connected to the 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the plane 1 output of a three-phase-alternating-current power supply via an opening and closing means, and. It is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus, and a single phase inversion circuit is connected to the remaining 2 phase input of a three-phase-circuit load apparatus, When an opening and closing means makes the output of a single phase inversion circuit power supply voltage with the three-phase-circuit voltage to the voltage mostly by a keying-circuit control means, it will be in a closed circuit state, It is controlled to be in an open state, when making the output of a single phase inversion circuit into the three-phase-circuit voltage up to 1/about 2 time of power supply voltage, and further by a three-phase-circuit control means. Since a single phase inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to the switching condition of an opening and closing means, the output from a single phase inversion circuit can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to 1/about 2 time of power supply voltage with power supply voltage. And when the output of a single phase inversion circuit is up to 1/about 2 time of power supply voltage. Since the voltage change by switching will be 1/about 2 time, in addition to a bigger effect being acquired to leak current and power supply noise control, the rate of a carrier frequency component over output voltage is controlled, and the ripple component of current and the quasistable state of load can be controlled.

[0078]According to the next invention, a three-phase-circuit rectification circuit is connected to the 3-phase output of a three-phase-alternating-current power supply, and one of the intermediate connection parts of the capacitors of a smoothing circuit is connected to the plane 1 of the three-phase-circuit inputs of a three-phase-circuit load apparatus via the 1st opening and closing means, and. It is connected to the plane 1 output of a three-phase-alternating-current power supply via the 2nd opening and closing means, is connected to the three-phase-circuit input of a three-phase-circuit load apparatus by the three-phase-circuit inversion circuit, and by a keying-circuit control means. Corresponding to the output voltage range of a three-phase-circuit inversion circuit, each switching condition of the 1st opening and closing means and the 2nd opening and closing means is controlled, and further by a three-phase-circuit control means. Since a three-phase-circuit inversion circuit is controlled so that 3-phase alternating-current voltage is supplied to a three-phase-circuit load apparatus corresponding to the switching condition of the 1st opening and closing means and the 2nd opening and closing means, The output from a three-phase-circuit inversion circuit can be mostly changed to the three-phase-circuit voltage to the voltage, and the three-phase-circuit voltage up to the twice [about] of power supply voltage with the three-phase-circuit voltage up to 1/about 2 time of power supply voltage, and power supply voltage.

[0079]According to the next invention, a three-phase-circuit rectification circuit is connected to the 3-phase output of a three-phase-alternating-current power supply, Since one of the intermediate connection parts of the capacitors of a smoothing circuit is connected at the neutral point of a three-phase-alternating-current power supply and a three-phase-circuit inversion circuit is connected to the three-phase-circuit input of a three-phase-circuit load apparatus, Since the instant voltage to the earth potentials which can increase and are further impressed to a three-phase-circuit load apparatus can also control the output of a three-phase-circuit inversion circuit, leak current and a power supply noise can be controlled.

[0080]According to the next invention, since it is connected also at the neutral point of a three-phase-circuit load apparatus, as for the intermediate connection part of the capacitors of a

smoothing circuit, the neutral point potential of a three-phase-circuit load apparatus is stabilized, and it can control leak current and a power supply noise further.

[Translation done.]

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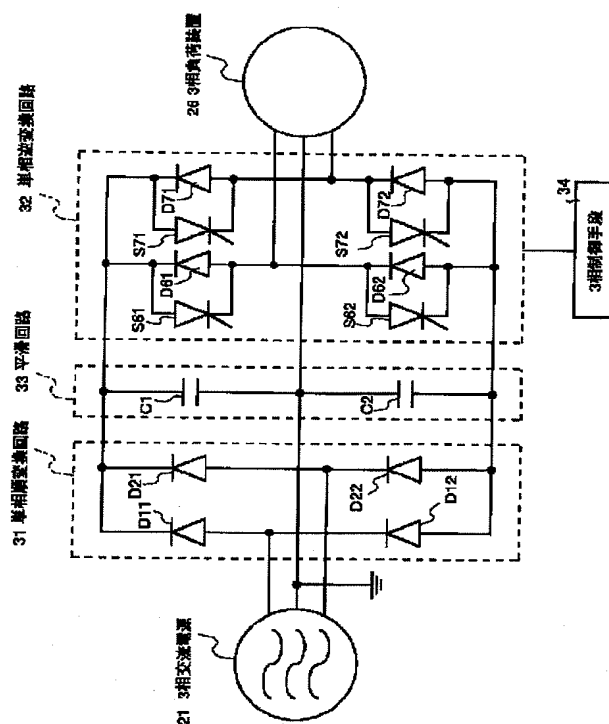
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(54) 【発明の名称】 3相インバータ装置

(57) 【要約】

【課題】 3相インバータ装置において、漏洩電流および電源ノイズを抑制し、さらには小型化、構成部品点数の削減および低コスト化を実現すること。

【解決手段】 3相交流電源21の、单相順変換回路31に未接続の1相を、平滑回路33のコンデンサC1とコンデンサC2との中間接続部に接続すると共に、3相負荷装置26の、单相逆変換回路32に未接続の1相に接続することにより、コンデンサC1、C2にそれぞれ印加される直流電圧を、接地電位を基準として最大で3相交流電源21の線間電圧の約2倍程度の電位に固定し、それを3相逆変換回路32を経て3相負荷装置26に印加する。それによって3相負荷装置26の1相の電位を接地電位とし、他の相の電圧の瞬時値を、最大で3相交流電源21の線間電圧の約2倍程度の電位に抑制する。



【特許請求の範囲】

【請求項 1】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

3 相交流電源の 3 相出力のうちの 2 相に接続される単相順変換回路と、

前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの間接続部の一つが、前記 3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力

のうちの 1 相に接続される平滑回路と、

前記平滑回路に接続され、かつ前記 3 相負荷装置の残りの 2 相入力に接続される単相逆変換回路と、

前記 3 相負荷装置に 3 相交流電圧を供給するように前記単相逆変換回路を制御する 3 相制御手段と、

を具備することを特徴とする 3 相インバータ装置。

【請求項 2】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなる単相高力率順変換回路と、

前記単相高力率順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの間接続部の一つが、前記 3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力

のうちの 1 相に接続される平滑回路と、

前記平滑回路に接続され、かつ前記 3 相負荷装置の残りの 2 相入力に接続される単相逆変換回路と、

前記 3 相負荷装置に 3 相交流電圧を供給するように前記単相逆変換回路を制御する 3 相制御手段と、

前記 3 相交流電源から流入する電流を概略正弦波化して力率を改善するように前記単相高力率順変換回路を制御する高力率順変換制御手段と、

を具備することを特徴とする 3 相インバータ装置。

【請求項 3】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

3 相交流電源の 3 相出力のうちの 2 相に接続される単相順変換回路と、

前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの間接続部の一つが、前記 3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力

のうちの 1 相に、回路の開閉を切り替えるための開閉手段を介して接続され得る平滑回路と、

前記平滑回路に接続され、かつ前記 3 相負荷装置の 3 相入力に接続される 3 相逆変換回路と、

前記 3 相逆変換回路の出力を電源電圧とほぼ同電圧までの 3 相電圧とする場合に閉路状態とし、また前記 3 相逆

変換回路の出力を電源電圧のほぼ 2 倍までの 3 相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、

前記開閉手段の開閉状態に対応して前記 3 相負荷装置に 3 相交流電圧を供給するように前記 3 相逆変換回路を制御する 3 相制御手段と、

を具備することを特徴とする 3 相インバータ装置。

【請求項 4】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

3 相交流電源の 3 相出力に接続される 3 相順変換回路と、

前記 3 相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの間接続部の一つが、前記 3 相交流電源の 1 相出力に、回路の開閉を切り替えるための開閉手段

を介して接続され得ると共に、3 相負荷装置の 3 相入力

のうちの 1 相に接続される平滑回路と、

前記平滑回路に接続され、かつ前記 3 相負荷装置の残りの 2 相入力に接続される単相逆変換回路と、

前記単相逆変換回路の出力を電源電圧とほぼ同電圧までの 3 相電圧とする場合に閉路状態とし、また前記単相逆

変換回路の出力を電源電圧のほぼ 2 分の 1 倍までの 3 相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、

前記開閉手段の開閉状態に対応して前記 3 相負荷装置に 3 相交流電圧を供給するように前記単相逆変換回路を制御する 3 相制御手段と、

を具備することを特徴とする 3 相インバータ装置。

【請求項 5】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

3 相交流電源の 3 相出力に接続される 3 相順変換回路と、

前記 3 相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの間接続部の一つが、3 相負荷装置の 3 相入力

のうちの 1 相に、回路の開閉を切り替えるための第 1 の開閉手段を介して接続され得ると共に、前記 3 相

交流電源の 1 相出力に、回路の開閉を切り替えるための第 2 の開閉手段を介して接続され得る平滑回路と、

前記平滑回路に接続され、かつ前記 3 相負荷装置の 3 相入力に接続される 3 相逆変換回路と、

前記 3 相逆変換回路の出力電圧範囲に対応して前記第 1 の開閉手段および前記第 2 の開閉手段のそれぞれの開閉状態を制御する開閉回路制御手段と、

前記第 1 の開閉手段および前記第 2 の開閉手段の開閉状態に対応して前記 3 相負荷装置に 3 相交流電圧を供給するように前記 3 相逆変換回路を制御する 3 相制御手段と、

を具備することを特徴とする 3 相インバータ装置。

【請求項 6】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

3 相交流電源の 3 相出力に接続される 3 相順変換回路と、

前記 3 相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの間接続部の一つが、3 相負荷装置の 3 相入力

を具備することを特徴とする 3 相インバータ装置。

【請求項 6】 3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、

3 相交流電源の 3 相出力に接続される 3 相順変換回路と、

前記 3 相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが前記 3 相交流電源の中性点に接続される平滑回路と、

前記平滑回路に接続され、かつ前記 3 相負荷装置の 3 相入力に接続される 3 相逆変換回路と、

を具備することを特徴とする 3 相インバータ装置。

【請求項 7】 前記平滑回路のコンデンサどうしの前記中間接続部が、前記 3 相負荷装置の中性点にも接続されることを特徴とする請求項 6 に記載の 3 相インバータ装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、3 相交流電源の電圧および周波数を変換して出力する 3 相インバータ装置に関する。

【0002】

【従来の技術】図 11 は、一般的な 3 相インバータ装置の構成を示すブロック図である。このインバータ装置は、一対のダイオードを直列接続したダイオード列が三つ並列に接続された構成の 3 相順変換回路 11 と、一対のダイオードを直列接続したダイオード列が三つ並列に接続され、かつ各ダイオードに一つずつスイッチ素子が逆並列接続された構成の 3 相逆変換回路 12 と、平滑コンデンサ 13 とが並列に接続された構成となっている。なお、逆並列接続とは、二つの素子が極性を反対にして並列に接続されていることを意味する。

【0003】3 相順変換回路 11 の三つのダイオード列において、それぞれの列の一対のダイオードの中間接続部には、3 相交流電源 21 の 3 相が 1 相ずつ供給されている。

【0004】3 相逆変換回路 12 の 3 相の出力は、3 相逆変換回路 12 の三つのダイオード列において、それぞれの列の一対のダイオードの中間接続部から、3 相負荷装置 26 の各相に 1 相ずつ供給されている。

【0005】図 11 に示す構成の 3 相インバータ装置では、3 相交流電源 21 の 1 相が接地されている場合、接地電位に対して不特定の電位が 3 相負荷装置 26 に印加されることが知られている。その印加される不特定電位は、3 相逆変換回路 12 内のスイッチ素子により高速に変化し、また 3 相負荷装置 26 と接地電位との間の浮遊容量により漏れ電流が大きくなるため、電源ノイズや漏洩電流の増加原因となっている。そのため、その不特定電位の影響をできるだけ抑制するのが好ましい。またイ

ンバータ装置の小型化、構成部品点数の削減、低コスト化も要求される。

【0006】ところで単相インバータ回路では、漏洩電流および電源ノイズを低減するための対策を施した回路が提案されている（富士時報、Vol. 71、No. 7、p. 407-410、1998）。この単相インバータ回路は、図 12 に示すように、一対のダイオードを直列接続し、かつ各ダイオードに一つずつスイッチ素子を逆並列接続した構成の単相高力率コンバータ回路 14 と、一対のダイオードを直列接続し、かつ各ダイオードに一つずつスイッチ素子を逆並列接続した構成の単相逆変換回路 15 と、一対のコンデンサを直列接続した平滑回路 16 とが並列に接続された構成となっている。

【0007】そして単相交流電源 22 の 2 相のうちの一方の出力相は、交流リアクトル 17 を介して単相高力率コンバータ回路 14 の一対のダイオードの中間接続部に供給されているとともに、単相交流電源 22 の他方の出力相は、平滑回路 16 の一対のコンデンサの中間接続部および単相逆変換回路出力部 27 の一方の出力相に供給されている。また単相逆変換回路出力部 27 のもう一方の出力相には、単相逆変換回路 15 の一対のダイオードの中間接続部からの出力が供給される。

【0008】この図 12 に示す単相インバータ回路によれば、漏洩電流および電源ノイズの両方を抑制し、さらには小型化、構成部品点数の削減および低コスト化を実現することができるという効果が得られるとしている。

【0009】

【発明が解決しようとする課題】しかしながら、3 相インバータ装置では、上述した単相インバータ回路のように漏洩電流の抑制および電源ノイズの抑制を実現することは未だ困難であり、またインバータ装置の小型化、構成部品点数の削減および低コスト化等の要求を満たすことも困難である。

【0010】

【発明が解決しようとする課題】しかしながら、3 相インバータ装置では、上述した単相インバータ回路のように漏洩電流の抑制および電源ノイズの抑制を実現することは未だ困難であり、またインバータ装置の小型化、構成部品点数の削減および低コスト化等の要求を満たすことも困難である。

【0011】

【0010】本発明は、上記事情に鑑みなされたもので、3 相インバータ装置において、漏洩電流および電源ノイズを抑制し、さらには小型化、構成部品点数の削減および低コスト化を実現することができる 3 相インバータ装置を得ることを目的とする。

【0011】

【課題を解決するための手段】上記目的を達成するため、本発明は、3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、3 相交流電源の 3 相出力のうちの 2 相に接続される単相順変換回路と、前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記 3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力のうちの 1 相に接続される平滑回路と、前記平滑回路に接続され、かつ前記 3 相負荷装置の残りの 2 相入力に接続される単相

逆変換回路と、前記 3 相負荷装置に 3 相交流電圧を供給するように前記単相逆変換回路を制御する 3 相制御手段と、を具備する。

【0012】この発明によれば、単相順変換回路が 3 相交流電源の 3 相出力のうちの 2 相に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力の中の 1 相に接続され、単相逆変換回路が 3 相負荷装置の残りの 2 相入力に接続され、3 相制御手段により、3 相負荷装置に 3 相交流電圧が供給されるように単相逆変換回路が制御される。

【0013】また本発明は、3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなる単相高力率順変換回路と、前記単相高力率順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記 3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力の中の 1 相に接続される平滑回路と、前記平滑回路に接続され、かつ前記 3 相負荷装置の残りの 2 相入力に接続される単相逆変換回路と、前記 3 相負荷装置に 3 相交流電圧を供給するように前記単相逆変換回路を制御する 3 相制御手段と、前記 3 相交流電源から流入する電流を概略正弦波化して力率を改善するように前記単相高力率順変換回路を制御する高力率順変換制御手段と、を具備する。

【0014】この発明によれば、単相高力率順変換回路が、単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなり、平滑回路のコンデンサどうしの中間接続部の一つが、3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力の中の 1 相に接続され、単相逆変換回路が 3 相負荷装置の残りの 2 相入力に接続され、3 相制御手段により、3 相負荷装置に 3 相交流電圧が供給されるように単相逆変換回路が制御され、さらに高力率順変換制御手段により、3 相交流電源から流入する電流が概略正弦波化されて力率が改善されるように単相高力率順変換回路が制御される。

【0015】また本発明は、3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、3 相交流電源の 3 相出力のうちの 2 相に接続される単相順変換回路と、前記単相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記 3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力の中の 1 相に、回路の開閉を切り替えるための開閉手段を介して接続され得る平滑回路と、前記平滑回路に接

続され、かつ前記 3 相負荷装置の 3 相入力に接続される 3 相逆変換回路と、前記 3 相逆変換回路の出力を電源電圧とほぼ同電圧までの 3 相電圧とする場合に閉路状態とし、また前記 3 相逆変換回路の出力を電源電圧のほぼ 2 倍までの 3 相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、前記開閉手段の開閉状態に対応して前記 3 相負荷装置に 3 相交流電圧を供給するように前記 3 相逆変換回路を制御する 3 相制御手段と、を具備する。

【0016】この発明によれば、単相順変換回路が 3 相交流電源の 3 相出力のうちの 2 相に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、3 相交流電源の残りの 1 相出力に接続されると共に、3 相負荷装置の 3 相入力の中の 1 相に開閉手段を介して接続され、3 相逆変換回路が 3 相負荷装置の 3 相入力に接続され、開閉回路制御手段により開閉手段が、3 相逆変換回路の出力を電源電圧とほぼ同電圧までの 3 相電圧とする場合に閉路状態となり、また 3 相逆変換回路の出力を電源電圧のほぼ 2 倍までの 3 相電圧とする場合に開路状態となるように制御され、さらに 3 相制御手段により、開閉手段の開閉状態に対応して 3 相負荷装置に 3 相交流電圧が供給されるように 3 相逆変換回路が制御される。

【0017】また本発明は、3 相交流電源の電圧および周波数の一方または両方を変換して 3 相負荷装置に出力するインバータ装置であって、3 相交流電源の 3 相出力に接続される 3 相順変換回路と、前記 3 相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、前記 3 相交流電源の 1 相出力に、回路の開閉を切り替えるための開閉手段を介して接続され得ると共に、3 相負荷装置の 3 相入力の中の 1 相に接続される平滑回路と、前記平滑回路に接続され、かつ前記 3 相負荷装置の残りの 2 相入力に接続される単相逆変換回路と、前記単相逆変換回路の出力を電源電圧とほぼ同電圧までの 3 相電圧とする場合に閉路状態とし、また前記単相逆変換回路の出力を電源電圧のほぼ 2 分の 1 倍までの 3 相電圧とする場合に開路状態とするように前記開閉手段を制御する開閉回路制御手段と、前記開閉手段の開閉状態に対応して前記 3 相負荷装置に 3 相交流電圧を供給するように前記単相逆変換回路を制御する 3 相制御手段と、を具備する。

【0018】この発明によれば、3 相順変換回路が 3 相交流電源の 3 相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、3 相交流電源の 1 相出力に開閉手段を介して接続されると共に、3 相負荷装置の 3 相入力の中の 1 相に接続され、単相逆変換回路が 3 相負荷装置の残りの 2 相入力に接続され、開閉回路制御手段により開閉手段が、単相逆変換回路の出力を電源電圧とほぼ同電圧までの 3 相電圧とする場合に閉路状態となり、また単相逆変換回路の出力を電源電圧のほぼ 2 分

の1倍までの3相電圧とする場合に開路状態となるように制御され、さらに3相制御手段により、開閉手段の開閉状態に対応して3相負荷装置に3相交流電圧が供給されるように単相逆変換回路が制御される。

【0019】また本発明は、3相交流電源の電圧および周波数の一方または両方を変換して3相負荷装置に出力するインバータ装置であって、3相交流電源の3相出力に接続される3相順変換回路と、前記3相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが、3相負荷装置の3相入力の中の1相に、回路の開閉を切り替えるための第1の開閉手段を介して接続され得ると共に、前記3相交流電源の1相出力に、回路の開閉を切り替えるための第2の開閉手段を介して接続され得る平滑回路と、前記平滑回路に接続され、かつ前記3相負荷装置の3相入力に接続される3相逆変換回路と、前記3相逆変換回路の出力電圧範囲に対応して前記第1の開閉手段および前記第2の開閉手段のそれぞれの開閉状態を制御する開閉回路制御手段と、前記第1の開閉手段および前記第2の開閉手段の開閉状態

に対応して前記3相負荷装置に3相交流電圧を供給するように前記3相逆変換回路を制御する3相制御手段と、を具備する。

【0020】この発明によれば、3相順変換回路が3相交流電源の3相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが、3相負荷装置の3相入力の中の1相に第1の開閉手段を介して接続されると共に、3相交流電源の1相出力に第2の開閉手段を介して接続され、3相逆変換回路が3相負荷装置の3相入力に接続され、開閉回路制御手段により、3相逆変換回路の出力電圧範囲に対応して第1の開閉手段および第2の開閉手段のそれぞれの開閉状態が制御され、さらに3相制御手段により、第1の開閉手段および第2の開閉手段の開閉状態に対応して3相負荷装置に3相交流電圧が供給されるように3相逆変換回路が制御される。

【0021】また本発明は、3相交流電源の電圧および周波数の一方または両方を変換して3相負荷装置に出力するインバータ装置であって、3相交流電源の3相出力に接続される3相順変換回路と、前記3相順変換回路の直流側に接続され、かつ少なくとも一対のコンデンサが直列接続されており、それらコンデンサどうしの中間接続部の一つが前記3相交流電源の中性点に接続される平滑回路と、前記平滑回路に接続され、かつ前記3相負荷装置の3相入力に接続される3相逆変換回路と、を具備する。

【0022】この発明によれば、3相順変換回路が3相交流電源の3相出力に接続され、平滑回路のコンデンサどうしの中間接続部の一つが3相交流電源の中性点に接続され、3相逆変換回路が3相負荷装置の3相入力に接続される。

【0023】この発明において、前記平滑回路のコンデンサどうしの前記中間接続部が、前記3相負荷装置の中性点にも接続されていてもよい。

【0024】この発明によれば、平滑回路のコンデンサどうしの中間接続部は3相負荷装置の中性点にも接続される。

【0025】

【発明の実施の形態】以下、添付図面を参照して、本発明にかかる3相インバータ装置の実施の形態を詳細に説明する。

【0026】実施の形態1. 図1は、本発明の実施の形態1にかかる3相インバータ装置の構成を示すブロック図である。このインバータ装置は、一対のダイオードD11、D12を直列接続したダイオード列と一対のダイオードD21、D22を直列接続したダイオード列とが並列に接続された構成の単相順変換回路31と、一対のダイオードD61、D62を直列接続したダイオード列と一対のダイオードD71、D72を直列接続したダイオード列とが並列に接続され、かつ各ダイオードD61、D62、D71、D72に一つずつスイッチ素子S61、S62、S71、S72が逆並列接続された構成の単相逆変換回路32と、一対のコンデンサC1、C2を直列接続した平滑回路33とが並列に接続された構成となっている。

【0027】単相順変換回路31の二つのダイオード列において、ダイオードD11とダイオードD12との中間接続部、およびダイオードD21とダイオードD22との中間接続部には、3相交流電源21の3相のうちの2相が1相ずつ供給されている。3相交流電源21の残りの1相は、接地され、かつ平滑回路33のコンデンサC1とコンデンサC2との中間接続部、および3相負荷装置26の3相の入力の中の1相に供給されている。3相負荷装置26の入力の残りの2相には、単相逆変換回路32のダイオードD61とダイオードD62との中間接続部からの出力、およびダイオードD71とダイオードD72との中間接続部からの出力がそれぞれ供給される。

【0028】単相逆変換回路32は3相制御手段34により制御されている。3相制御手段34は、3相負荷装置26に3相交流電圧を供給するように制御するための手段である。

【0029】つぎに実施の形態1の作用について説明する。3相交流電源21の、単相順変換回路31に未接続の1相が、平滑回路33のコンデンサC1とコンデンサC2との中間接続部に接続されていることよって、3相交流電源21の線間電圧の約 $\sqrt{2}$ 倍程度の電位が、平滑回路33の両コンデンサC1、C2のそれぞれの両極間に印加される。また3相制御手段34により平滑回路33の中間接続部からの出力に対して単相逆変換回路32の1相の出力を制御し、それによって3相負荷装置26

の一線間に、所望の電圧値および周波数を有する電圧VRSを印加する。

【0030】また3相制御手段34により平滑回路33の中間接続部からの出力に対して単相逆変換回路32の残りの1相の出力を制御し、それによって3相負荷装置26の他の線間に、電圧VRSに対して位相が120°異なる電圧VSTを印加する。電圧VRSおよび電圧VSTにより、残りの電圧VTRが自然に定まるので、単相逆変換回路32の構成でもって3相交流出力を得ることができる。

【0031】実施の形態1によれば、3相交流電源21の、単相順変換回路31に未接続の1相が、平滑回路33のコンデンサC1とコンデンサC2との中間接続部に接続され、かつ3相負荷装置26の、単相逆変換回路32に未接続の1相に接続されているため、コンデンサC1、C2にそれぞれ印加される直流電圧は、接地電位を基準として最大で3相交流電源21の線間電圧の約 $\sqrt{2}$ 倍程度の電位に固定され、その直流電圧が3相逆変換回路32を経て3相負荷装置26に印加されるので、3相負荷装置26の1相の電位を接地電位とし、他の相の電圧の瞬時値を、最大で3相交流電源21の線間電圧の約 $\sqrt{2}$ 倍程度の電位に抑制することができる。その結果、漏洩電流および電源ノイズを抑制することができる。

【0032】また実施の形態1によれば、順変換回路31の構成が一般的な単相順変換回路と同様であり、また逆変換回路32の構成も一般的な単相逆変換回路と同様であるため、インバータ装置の小型化、構成部品点数の削減および低コスト化が可能となる。さらに構成部品点数の削減に伴い、損失も低減できる。

【0033】なお、上記構成のインバータ装置に交流リアクトルおよび直流リアクトルを任意に組み合わせてもよく、そうすれば電源の力率を改善することができると共に、電流の高調波成分を抑制することができる。

【0034】実施の形態2。図2は、本発明の実施の形態2にかかる3相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態1と異なるのは、単相順変換回路31の代わりに単相高力率順変換回路41を設けたことと、単相高力率順変換回路41の3相交流電源21側にそれぞれ交流リアクトル42、43を接続したことと、単相高力率順変換回路41を制御する高力率順変換制御手段44を設けたことである。その他の構成は上記実施の形態1（図1参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【0035】単相高力率順変換回路41は、一対の単相フルブリッジ整流器D111、D112を直列接続した整流器列と一対の単相フルブリッジ整流器D121、D122を直列接続した整流器列とが並列に接続され、かつ各単相フルブリッジ整流器D111、D112、D121、D122に一つずつスイッチ素子S111、S1

12、S121、S122が逆並列接続された構成となっている。

【0036】高力率順変換制御手段44は、3相交流電源21から流入する電流を概略正弦波化し、力率改善を可能とするよう単相高力率順変換回路41の制御を行う。

【0037】つぎに実施の形態2の作用について説明する。単相高力率順変換回路41の内部の1相出力と、3相交流電源21の、平滑回路33のコンデンサC1とコンデンサC2との中間接続点に接続された相との間で、所望の電圧値および周波数を有する電圧VRS_convが発生する。この電圧VRS_convは電源相電圧VRSに対して、交流リアクトル間に印加され、それによって流れる電源電流が決まる。従って高力率順変換制御手段44により単相高力率順変換回路41を制御し、電源電流を概略正弦波化し、力率を改善し得るような電圧VRS_convを発生させる。

【0038】単相高力率順変換回路41の内部の他の1相出力と、3相交流電源21の、コンデンサC1とコンデンサC2との中間接続点に接続された相との間についても、高力率順変換制御手段44により同様の制御を行い、電源電流を概略正弦波化し、力率を改善し得るような電圧VST_convを発生させる。

【0039】逆変換回路32の制御については実施の形態1と同様であるので、説明を省略する。

【0040】実施の形態2によれば、実施の形態1と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られるのに加えて、3相交流電源21の順変換回路として単相高力率順変換回路41を用いたため、3相交流電源21から流入する電流を概略正弦波化し、力率を改善することができるという効果が得られる。

【0041】実施の形態3。図3は、本発明の実施の形態3にかかる3相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態1と異なるのは、単相逆変換回路32の代わりに3相逆変換回路52を設け、3相逆変換回路52の3相の出力を3相負荷装置26の各相に1相ずつ供給するようにしたことと、平滑回路33のコンデンサC1とコンデンサC2との中間接続部を、3相逆変換回路52の1相部分の出力点にスイッチ等の開閉手段54を介して接続したことと、その開閉手段54の開閉を制御する開閉回路制御手段55を設けたことと、3相逆変換回路52を制御するための3相制御手段56を設けたことである。その他の構成は上記実施の形態1（図1参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【0042】3相逆変換回路52は、一対のダイオードD261、D262を直列接続したダイオード列と一対

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のダイオードD271, D272を直列接続したダイオード列と一対のダイオードD281, D282を直列接続したダイオード列とが並列に接続され、かつ各ダイオードD261, D262, D271, D272, D281, D282に一つずつスイッチ素子S261, S262, S271, S272, S281, S282が逆並列接続された構成となっている。3相逆変換回路52の3相の出力は、各ダイオード列の一対のダイオードの中間接続部から、3相負荷装置26の各相に1相ずつ供給されている。

【0043】開閉回路制御手段55は、開閉手段54に対して、3相逆変換回路52から電源電圧とほぼ同電圧までの3相電圧を出力させる場合には開路状態とし、前記3相逆変換回路10の出力可能電圧を電源電圧のほぼ2倍までとする場合には開路状態とするように制御する。

【0044】3相制御手段56は、3相逆変換回路52に対して、開閉手段54の開閉状態に応じて3相負荷装置26に3相交流電圧を供給するように制御する。

【0045】図4は、実施の形態3のインバータ装置の動作を説明するためのフローチャートである。まず3相逆変換回路52の出力電圧 V_{out} の範囲が3相交流電源21の線間電圧 V_{in} より大きいかなかの判定を行う(ステップS1)。そして V_{out} が V_{in} 以上の時、すなわち3相交流電源21の線間電圧 V_{in} 以上の出力電圧を必要とする場合には、開閉手段54を開状態とし、3相逆変換回路52内の1相アームと平滑回路33のコンデンサC1, C2の中間接続部との接続を遮断する(ステップS2)。

【0046】その状態で3相制御手段56により3相逆変換回路52の3相アームをそれぞれ制御し、3相逆変換回路52の各出力相の相電圧を平滑回路33の低電圧側に対する高電圧側の電位である3相線間電圧の約2√2倍の電圧でスイッチング制御する(ステップS3)。それによって3相負荷装置26に3相交流電圧を印加し、一連の制御を終了する。

【0047】一方ステップS1で V_{out} が V_{in} よりも小さい時、すなわち3相交流電源21の線間電圧 V_{in} より小さい出力電圧を必要とする場合には、開閉手段54を開状態とし、3相逆変換回路52内の1相アームと平滑回路33のコンデンサC1, C2の中間接続部とを接続する(ステップS4)。そして3相逆変換回路52内の、平滑回路33のコンデンサC1, C2の中間接続部に接続されていない2相に関して、上記実施の形態1と同様の制御を実現し得るように3相制御手段56を制御し(ステップS5)、一連の制御を終了する。

【0048】実施の形態3によれば、3相逆変換回路52からの出力電圧を切り替えるための開閉手段54を設け、その開閉手段54の開閉状態を切り替え制御するようにしたため、3相逆変換回路52からの出力を、電源

電圧とほぼ同電圧までの3相電圧と、電源電圧のほぼ2倍までの3相電圧とに切り替えることができる。そして3相逆変換回路52から電源電圧とほぼ同電圧までの3相電圧を出力させる場合には、上記実施の形態1と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られる。

【0049】実施の形態4. 図5は、本発明の実施の形態4にかかる3相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態1と異なるのは、単相順変換回路31の代わりに3相順変換回路61を設け、3相順変換回路61の3相に3相交流電源21の3相出力を1相ずつ供給するようにしたことと、3相交流電源21の3相のうちの接地された1相を、平滑回路33のコンデンサC1とコンデンサC2との中間接続部にスイッチ等の開閉手段64を介して接続したことと、その開閉手段64の開閉を制御する開閉回路制御手段65を設けたことである。その他の構成は上記実施の形態1(図1参照)と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【0050】3相順変換回路61は、一対のダイオードD311, D312を直列接続したダイオード列と一対のダイオードD321, D322を直列接続したダイオード列と一対のダイオードD331, D332を直列接続したダイオード列とが並列に接続された構成となっている。3相交流電源21の出力は、各ダイオード列の一対のダイオードの中間接続部に1相ずつ供給される。

【0051】開閉回路制御手段65は、開閉手段64に対して、3相負荷装置26に電源電圧のほぼ2分の1(1/2)までの3相電圧を出力する場合には開路状態とし、3相負荷装置26への出力可能電圧を電源電圧とほぼ同電圧までとする場合には閉路状態とするように制御する。

【0052】図6は、実施の形態4のインバータ装置の動作を説明するためのフローチャートである。まず単相逆変換回路32の出力電圧 V_{out} の範囲が3相交流電源21の線間電圧 V_{in} より大きいかなかの判定を行う(ステップS11)。そして V_{out} がほぼ V_{in} とほぼ同じ電圧までの時、すなわち3相交流電源21の線間電圧 V_{in} とほぼ同電圧までの出力電圧を必要とする場合には、開閉手段64を開状態とし、3相順変換回路61内の1相アームと平滑回路33のコンデンサC1, C2の中間接続部とを接続する(ステップS12)。その状態で3相制御手段34により単相逆変換回路32に対して上記実施の形態1と同様の制御を行い(ステップS14)、3相負荷装置26に3相交流電圧を印加し、一連の制御を終了する。

【0053】一方ステップS11で V_{out} が V_{in} のほぼ2分の1(1/2)倍の電圧までの時、すなわち3相交

流電源 21 の線間電圧 V_{in} のほぼ 2 分の 1 ($1/2$) 倍までの出力電圧を必要とする場合には、開閉手段 64 を開状態とし、3 相順変換回路 61 内の 1 相アームと平滑回路 33 のコンデンサ C1、C2 の中間接続部との接続を遮断し (ステップ S13)、ステップ S14 へ進み、3 相負荷装置 26 に 3 相交流電圧を印加して一連の制御を終了する。

【0054】実施の形態 4 によれば、単相逆変換回路 32 からの出力電圧を切り替えるための開閉手段 64 を設け、その開閉手段 64 の開閉状態を切り替え制御するようにしたため、単相逆変換回路 32 からの出力を、電源電圧とほぼ同電圧までの 3 相電圧と、電源電圧のほぼ 2 分の 1 ($1/2$) 倍までの 3 相電圧とに切り替えることができる。そして単相逆変換回路 32 から電源電圧とほぼ同電圧までの 3 相電圧を出力させる場合には、上記実施の形態 1 と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られる。

【0055】また単相逆変換回路 32 から電源電圧のほぼ 2 分の 1 ($1/2$) 倍までの 3 相電圧を出力させる場合には、スイッチングによる電圧変化がほぼ 2 分の 1

($1/2$) 倍となるので、漏洩電流および電源ノイズ抑制に対しより大きな効果が得られるのに加えて、出力電圧に対するキャリア周波数成分の割合が抑制され、電流のリプル成分や、負荷の不安定状態を抑制することができる。

【0056】実施の形態 5. 図 7 は、本発明の実施の形態 5 にかかる 3 相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態 1 と異なるのは、単相順変換回路 31 の代わりに 3 相順変換回路 61 を設け、3 相順変換回路 61 の 3 相に 3 相交流電源 21 の 3 相出力を 1 相ずつ供給するようにしたことと、単相逆変換回路 32 の代わりに 3 相逆変換回路 52 を設け、3 相逆変換回路 52 の 3 相の出力を 3 相負荷装置 26 の各相に 1 相ずつ供給するようにしたことと、平滑回路 33 のコンデンサ C1 とコンデンサ C2 との中間接続部を、3 相逆変換回路 52 の 1 相部分の出力点にスイッチ等の第 1 の開閉手段 54 を介して接続したことと、3 相交流電源 21 の 3 相のうちの接地された 1 相を、平滑回路 33 のコンデンサ C1 とコンデンサ C2 との中間接続部にスイッチ等の第 2 の開閉手段 64 を介して接続したことと、第 1 の開閉手段 54 および第 2 の開閉手段 64 の開閉をそれぞれ制御する第 1 の開閉回路制御手段 55 および第 2 の開閉回路制御手段 65 を設けたことと、3 相逆変換回路 52 を制御するための 3 相制御手段 56 を設けたことである。その他の構成は上記実施の形態 1 (図 1 参照) と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【0057】3 相逆変換回路 52、第 1 の開閉手段 5

4、第 1 の開閉回路制御手段 55 および 3 相制御手段 56 は、それぞれ図 3 に示す実施の形態 3 の 3 相逆変換回路 52、開閉手段 54、開閉回路制御手段 55 および 3 相制御手段 56 と同様の構成のものである。従ってそれら回路および各手段の説明は、重複するため省略する。

【0058】3 相順変換回路 61、第 2 の開閉手段 64 および第 2 の開閉回路制御手段 65 は、それぞれ図 5 に示す実施の形態 4 の 3 相順変換回路 61、開閉手段 64 および開閉回路制御手段 65 と同様の構成のものである。従ってそれら回路および各手段の説明は、重複するため省略する。

【0059】図 8 は、実施の形態 5 のインバータ装置の動作を説明するためのフローチャートである。まず 3 相逆変換回路 52 の出力電圧 V_{out} の範囲が 3 相交流電源 21 の線間電圧 V_{in} より大きいのか否かの判定を行う (ステップ S21)。そして V_{out} が V_{in} 以上の時、すなわち 3 相交流電源 21 の線間電圧 V_{in} のほぼ 2 倍までの出力電圧を必要とする場合には、第 2 の開閉回路制御手段 65 により第 2 の開閉手段 64 を閉路状態とし、平滑回路 33 のコンデンサ C1、C2 の中間接続部を 3 相交流電源 21 に接続する (ステップ S22)。

【0060】そして第 1 の開閉回路制御手段 55 により第 1 の開閉手段 54 を開路状態とし、3 相逆変換回路 52 内の 1 相アームと平滑回路 33 のコンデンサ C1、C2 の中間接続部との接続を遮断する (ステップ S23)。その状態で 3 相制御手段 56 により 3 相逆変換回路 52 の 3 相アームをそれぞれ制御し、3 相逆変換回路 52 の各出力相の相電圧を平滑回路 33 の低電圧側に対する高電圧側の電位である 3 相線間電圧の約 $2\sqrt{2}$ 倍の電圧でスイッチング制御し (ステップ S24)、3 相負荷装置 26 に 3 相交流電圧を印加し、一連の制御を終了する。

【0061】一方ステップ S21 で V_{out} が V_{in} よりも小さい時、すなわち 3 相交流電源 21 の線間電圧 V_{in} より小さい出力電圧を必要とする場合には、 V_{out} が V_{in} のほぼ 2 分の 1 ($1/2$) 倍であるか否かの判定を行う (ステップ S25)。 V_{out} が V_{in} のほぼ 2 分の 1 ($1/2$) 倍である場合には、さらに 3 相交流電源 21 の電流の 3 相平衡を重視するか否かの判断を行う (ステップ S26)。

【0062】ステップ S26 で 3 相平衡を重視する場合には、第 2 の開閉回路制御手段 65 により第 2 の開閉手段 64 を開路状態とし、平滑回路 33 のコンデンサ C1、C2 の中間接続部と 3 相交流電源 21 との接続を遮断する (ステップ S27)。そして第 1 の開閉回路制御手段 55 により第 1 の開閉手段 54 を開路状態とし、3 相逆変換回路 52 内の 1 相アームと平滑回路 33 のコンデンサ C1、C2 の中間接続部との接続を遮断する (ステップ S28)。

【0063】その状態で 3 相制御手段 56 により 3 相逆

変換回路 52 の 3 相アームをそれぞれ制御し、3 相逆変換回路 52 の各出力相の相電圧を平滑回路 33 の低電圧側に対する高電圧側の電位である 3 相線間電圧の約 $\sqrt{2}$ 倍の電圧でスイッチング制御し（ステップ S 29）、3 相負荷装置 26 に 3 相交流電圧を印加し、一連の制御を終了する。

【0064】ステップ S 26 で 3 相平衡を重視せずに、漏洩電流および電源ノイズの抑制を重視する場合には、第 2 の開閉回路制御手段 65 により第 2 の開閉手段 64 を閉路状態とし、平滑回路 33 のコンデンサ C1、C2 の中間接続部を 3 相交流電源 21 に接続する（ステップ S 30）。そして第 1 の開閉回路制御手段 55 により第 1 の開閉手段 54 を閉路状態とし、3 相逆変換回路 52 内の 1 相アームを平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続する（ステップ S 31）。その状態で 3 相制御手段 56 により、3 相逆変換回路 52 内の、平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続されていない 2 相に関して、上記実施の形態 1 と同様の制御を行い（ステップ S 32）、3 相負荷装置 26 に 3 相交流電圧を印加して一連の制御を終了する。

【0065】ステップ S 25 で V_{out} が V_{in} のほぼ 2 分の 1 ($1/2$) 倍ではない場合には、第 2 の開閉回路制御手段 65 により第 2 の開閉手段 64 を閉路状態とし、平滑回路 33 のコンデンサ C1、C2 の中間接続部と 3 相交流電源 21 との接続を遮断する（ステップ S 33）。そして第 1 の開閉回路制御手段 55 により第 1 の開閉手段 54 を閉路状態とし、3 相逆変換回路 52 内の 1 相アームを平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続する（ステップ S 34）。その状態で 3 相制御手段 56 により、3 相逆変換回路 52 内の、平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続されていない 2 相に関して、上記実施の形態 1 と同様の制御を行い（ステップ S 35）、3 相負荷装置 26 に 3 相交流電圧を印加して一連の制御を終了する。

【0066】実施の形態 5 によれば、3 相逆変換回路 52 からの出力電圧を切り替えるための第 1 の開閉手段 54 および第 2 の開閉手段 64 を設け、それら第 1 および第 2 の開閉手段 54、64 の開閉状態を切り替え制御するようにしたため、3 相逆変換回路 52 からの出力を、電源電圧のほぼ 2 分の 1 ($1/2$) 倍までの 3 相電圧と、電源電圧とほぼ同電圧までの 3 相電圧と、電源電圧のほぼ 2 倍までの 3 相電圧とに切り替えることができる。そして 3 相逆変換回路 52 から電源電圧とほぼ同電圧までの 3 相電圧を出力させる場合には、上記実施の形態 1 と同様の効果、すなわち漏洩電流の抑制、電源ノイズの抑制、インバータ装置の小型化、構成部品点数の削減、低コスト化、および損失の低減が可能であるという効果が得られる。

【0067】また 3 相逆変換回路 52 から電源電圧のほぼ 2 分の 1 ($1/2$) 倍までの 3 相電圧を出力させる場

合には、スイッチングによる電圧変化がほぼ 2 分の 1

($1/2$) 倍となるので、漏洩電流および電源ノイズ抑制に対しより大きな効果が得られるのに加えて、出力電圧に対するキャリア周波数成分の割合が抑制され、電流のリプル成分や、負荷の不安定状態を抑制することができる。

【0068】実施の形態 6. 図 9 は、本発明の実施の形態 6 にかかる 3 相インバータ装置の構成を示すブロック図である。このインバータ装置が上記実施の形態 1 と異なるのは、3 相交流電源 21 に代えて 3 相 Y 接続電源 23 を用いたことと、単相順変換回路 31 の代わりに 3 相順変換回路 61 を設け、3 相順変換回路 61 の 3 相に 3 相 Y 接続電源の 3 相出力を 1 相ずつ供給するようにしたことと、単相逆変換回路 32 の代わりに 3 相逆変換回路 52 を設け、3 相逆変換回路 52 の 3 相の出力を 3 相負荷装置 26 の各相に 1 相ずつ供給するようにしたことと、3 相 Y 接続電源の中性点に平滑回路 33 のコンデンサ C1 とコンデンサ C2 との中間接続部を接続したことである。その他の構成は上記実施の形態 1（図 1 参照）と同様であるので、同様の構成については同一の符号を付して説明を省略する。

【0069】3 相逆変換回路 52 および 3 相順変換回路 61 は、それぞれ図 3 に示す実施の形態 3 の 3 相逆変換回路 52、および図 5 に示す実施の形態 4 の 3 相順変換回路 61 と同様の構成のものである。従ってそれらの回路の説明は、重複するため省略する。

【0070】つぎに実施の形態 6 の作用について説明する。平滑回路 33 の、3 相 Y 接続電源 23 との接続点と、平滑回路 33 の上位電位側との間の電圧は、3 相 Y 接続電源 23 の相電圧実効値の約 $\sqrt{2}$ 倍となる。同様に平滑回路 33 の、3 相 Y 接続電源 23 との接続点と、平滑回路 33 の下位電位側との間の電圧も 3 相 Y 接続電源 23 の相電圧実効値の約 $\sqrt{2}$ 倍となる。従って 3 相逆変換回路 52 に印加される直流電圧は、3 相 Y 接続電源 23 の相電圧実効値の約 $2\sqrt{2}$ 倍となり、3 相逆変換回路 52 の正弦波出力線間出力電圧実効値は、3 相 Y 接続電源 23 の相電圧実効値の約 $\sqrt{3}$ 倍となる。

【0071】それに対して 3 相 Y 接続電源 23 の中性点を平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続しない場合には、3 相逆変換回路 52 に印加される直流電圧は、3 相 Y 接続電源 23 の相電圧実効値の約 $\sqrt{6}$ 倍となり、3 相逆変換回路 52 の正弦波出力線間出力電圧実効値は、相電圧実効値の約 2 分の 3 ($3/2$) 倍までである。従って 3 相 Y 接続電源 23 の中性点を平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続したことにより、出力電圧が約 15% 増大する。

【0072】実施の形態 6 によれば、3 相 Y 接続電源 23 の中性点を平滑回路 33 のコンデンサ C1、C2 の中間接続部に接続したため、3 相逆変換回路 52 の出力を増大することができ、さらには 3 相負荷装置 26 に印加

される接地電位に対する瞬時電圧も抑制できるので、漏洩電流および電源ノイズを抑制することができる。

【0073】なお、図10に示す変形例のように、3相負荷装置26に代えて3相Y接続負荷装置28を用い、平滑回路33のコンデンサC1、C2の間接続部に3相Y接続負荷装置28の中性点と3相Y接続電源23の中性点の両方を接続してもよい。このようにすれば、3相逆変換回路52の出力増大効果、および3相Y接続負荷装置28に印加される接地電位に対する瞬時電圧の抑制効果に加えて、3相Y接続負荷装置28の中性点電位が安定するため、漏洩電流および電源ノイズをより一層抑制することができる。

【0074】

【発明の効果】以上、説明したとおり、本発明によれば、単相順変換回路が3相交流電源の3相出力のうちの2相に接続され、平滑回路のコンデンサどうしの間接続部の一つが、3相交流電源の残りの1相出力に接続されると共に、3相負荷装置の3相入力のうち1相に接続され、単相逆変換回路が3相負荷装置の残りの2相入力に接続され、3相制御手段により、3相負荷装置に3相交流電圧が供給されるように単相逆変換回路が制御されるため、3相負荷装置の1相の電位を接地電位とし、他の相の電圧の瞬時値を、最大で3相交流電源の線間電圧の約 $\sqrt{2}$ 倍程度の電位に抑制することができる。その結果、漏洩電流および電源ノイズを抑制することができる。また一般的な単相順変換回路および一般的な単相逆変換回路を用いることができるため、インバータ装置の小型化、構成部品点数の削減および低コスト化が可能となる。さらに構成部品点数の削減に伴い、損失も低減できる。

【0075】つぎの発明によれば、単相高力率順変換回路が、単相フルブリッジ整流器および前記単相フルブリッジ整流器に逆並列接続されたスイッチ素子からなり、平滑回路のコンデンサどうしの間接続部の一つが、3相交流電源の残りの1相出力に接続されると共に、3相負荷装置の3相入力のうち1相に接続され、単相逆変換回路が3相負荷装置の残りの2相入力に接続され、3相制御手段により、3相負荷装置に3相交流電圧が供給されるように単相逆変換回路が制御され、さらに高力率順変換制御手段により、3相交流電源から流入する電流が概略正弦波化されて力率が改善されるように単相高力率順変換回路が制御されるため、3相交流電源から流入する電流を概略正弦波化し、力率を改善することができる。

【0076】つぎの発明によれば、単相順変換回路が3相交流電源の3相出力のうちの2相に接続され、平滑回路のコンデンサどうしの間接続部の一つが、3相交流電源の残りの1相出力に接続されると共に、3相負荷装置の3相入力のうち1相に開閉手段を介して接続され、3相逆変換回路が3相負荷装置の3相入力に接続さ

れ、開閉回路制御手段により開閉手段が、3相逆変換回路の出力を電源電圧とほぼ同電圧までの3相電圧とする場合に閉路状態となり、また3相逆変換回路の出力を電源電圧のほぼ2倍までの3相電圧とする場合に開路状態となるように制御され、さらに3相制御手段により、開閉手段の開閉状態に対応して3相負荷装置に3相交流電圧が供給されるように3相逆変換回路が制御されるため、3相逆変換回路からの出力を、電源電圧とほぼ同電圧までの3相電圧と、電源電圧のほぼ2倍までの3相電圧とに切り替えることができる。

【0077】つぎの発明によれば、3相順変換回路が3相交流電源の3相出力に接続され、平滑回路のコンデンサどうしの間接続部の一つが、3相交流電源の1相出力に開閉手段を介して接続されると共に、3相負荷装置の3相入力のうち1相に接続され、単相逆変換回路が3相負荷装置の残りの2相入力に接続され、開閉回路制御手段により開閉手段が、単相逆変換回路の出力を電源電圧とほぼ同電圧までの3相電圧とする場合に閉路状態となり、また単相逆変換回路の出力を電源電圧のほぼ2分の1倍までの3相電圧とする場合に開路状態となるように制御され、さらに3相制御手段により、開閉手段の開閉状態に対応して3相負荷装置に3相交流電圧が供給されるように単相逆変換回路が制御されるため、単相逆変換回路からの出力を、電源電圧とほぼ同電圧までの3相電圧と、電源電圧のほぼ2分の1倍までの3相電圧とに切り替えることができる。そして、単相逆変換回路の出力が電源電圧のほぼ2分の1倍までの場合には、スイッチングによる電圧変化がほぼ2分の1倍となるので、漏洩電流および電源ノイズ抑制に対しより大きな効果が得られるのに加えて、出力電圧に対するキャリア周波数成分の割合が抑制され、電流のリプル成分や、負荷の不安定状態を抑制することができる。

【0078】つぎの発明によれば、3相順変換回路が3相交流電源の3相出力に接続され、平滑回路のコンデンサどうしの間接続部の一つが、3相負荷装置の3相入力のうち1相に第1の開閉手段を介して接続されると共に、3相交流電源の1相出力に第2の開閉手段を介して接続され、3相逆変換回路が3相負荷装置の3相入力に接続され、開閉回路制御手段により、3相逆変換回路の出力電圧範囲に対応して第1の開閉手段および第2の開閉手段のそれぞれの開閉状態が制御され、さらに3相制御手段により、第1の開閉手段および第2の開閉手段の開閉状態に対応して3相負荷装置に3相交流電圧が供給されるように3相逆変換回路が制御されるため、3相逆変換回路からの出力を、電源電圧のほぼ2分の1倍までの3相電圧と、電源電圧とほぼ同電圧までの3相電圧と、電源電圧のほぼ2倍までの3相電圧とに切り替えることができる。

【0079】つぎの発明によれば、3相順変換回路が3相交流電源の3相出力に接続され、平滑回路のコンデン

サどうしの中間接続部の一つが 3 相交流電源の中性点に接続され、3 相逆変換回路が 3 相負荷装置の 3 相入力に接続されるため、3 相逆変換回路の出力を増大することができ、さらには 3 相負荷装置に印加される接地電位に対する瞬時電圧も抑制できるので、漏洩電流および電源ノイズを抑制することができる。

【0080】つぎの発明によれば、平滑回路のコンデンサどうしの中間接続部は 3 相負荷装置の中性点にも接続されるため、3 相負荷装置の中性点電位が安定し、漏洩電流および電源ノイズをより一層抑制することができる。

【図面の簡単な説明】

【図 1】 本発明の実施の形態 1 にかかる 3 相インバータ装置の構成を示すブロック図である。

【図 2】 本発明の実施の形態 2 にかかる 3 相インバータ装置の構成を示すブロック図である。

【図 3】 本発明の実施の形態 3 にかかる 3 相インバータ装置の構成を示すブロック図である。

【図 4】 実施の形態 3 のインバータ装置の動作を説明するためのフローチャートである。

【図 5】 本発明の実施の形態 4 にかかる 3 相インバータ装置の構成を示すブロック図である。

【図 6】 実施の形態 4 のインバータ装置の動作を説明するためのフローチャートである。

* 【図 7】 本発明の実施の形態 5 にかかる 3 相インバータ装置の構成を示すブロック図である。

【図 8】 実施の形態 5 のインバータ装置の動作を説明するためのフローチャートである。

【図 9】 本発明の実施の形態 6 にかかる 3 相インバータ装置の構成を示すブロック図である。

【図 10】 本発明の実施の形態 7 にかかる 3 相インバータ装置の構成を示すブロック図である。

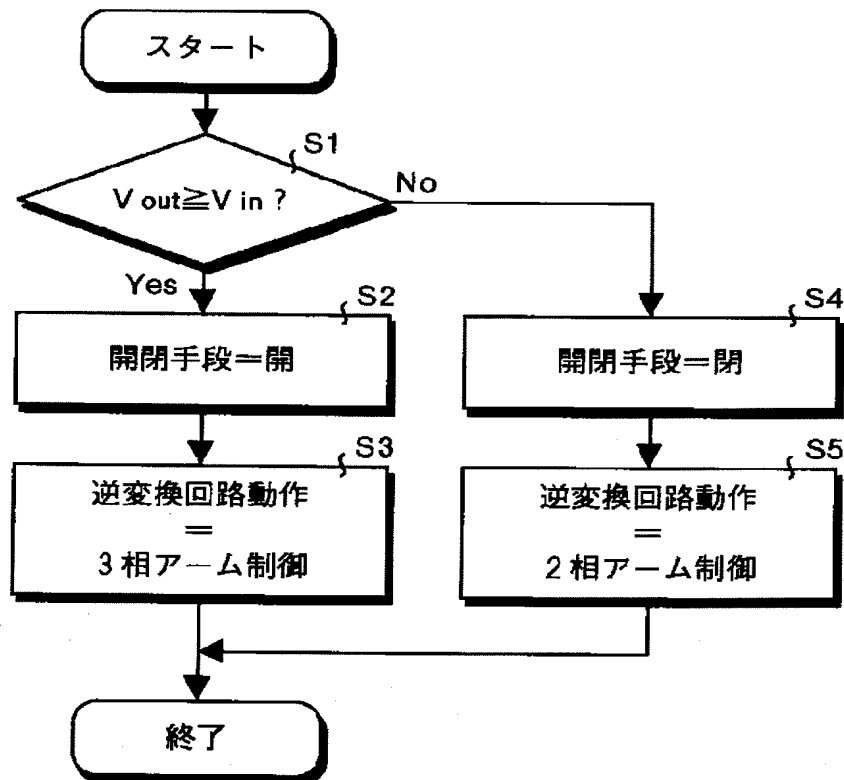
【図 11】 一般的な 3 相インバータ装置の構成を示すブロック図である。

【図 12】 漏洩電流および電源ノイズを低減するための対策を施した従来の単相インバータ回路の構成を示すブロック図である。

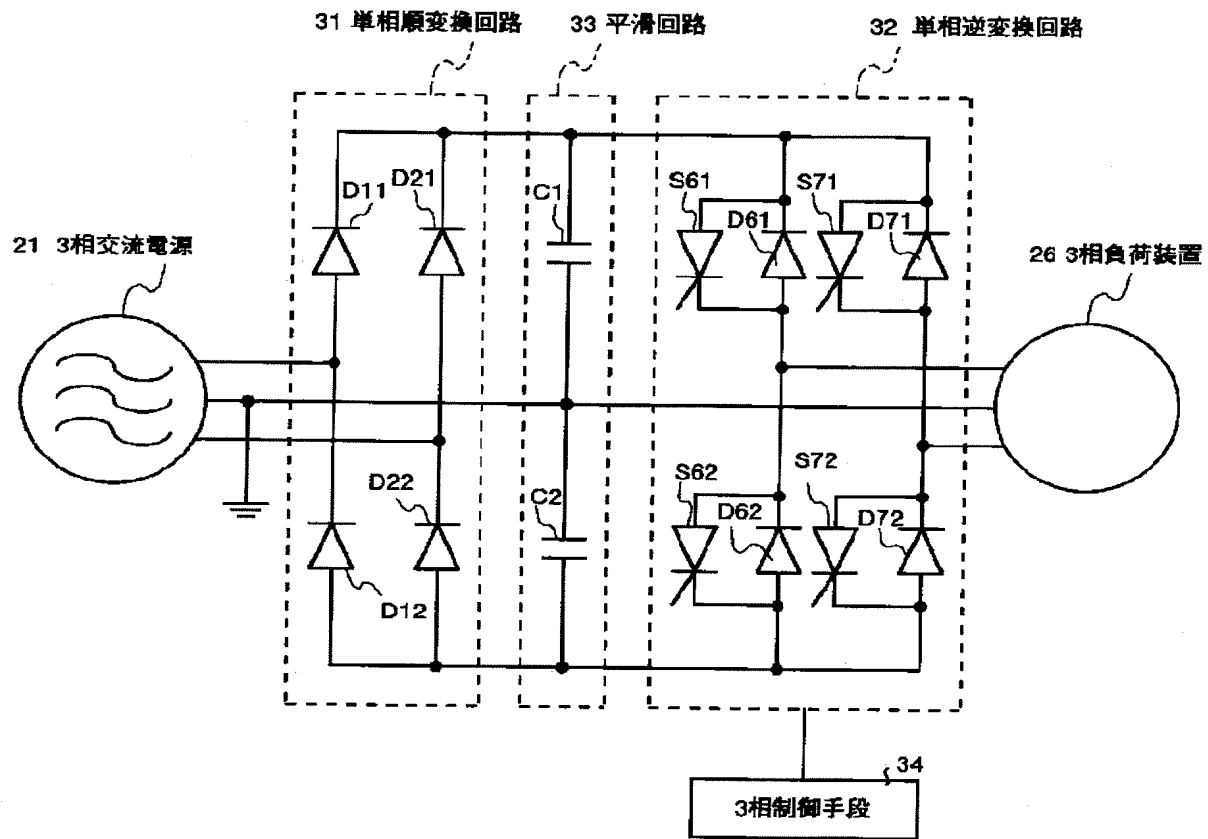
【符号の説明】

C1, C2 コンデンサ、D111, D112, D121, D122 単相フルブリッジ整流器、S111, S112, S121, S122 スイッチ素子、21, 23 3 相交流電源、26, 28 3 相負荷装置、31 単相順変換回路、32 単相逆変換回路、33 平滑回路、34, 56 3 相制御手段、41 単相高力率順変換回路、42, 43 リアクトル、44 高力率順変換制御手段、52 3 相逆変換回路、54, 64 開閉手段、55, 65 開閉回路制御手段、61 3 相順変換回路。

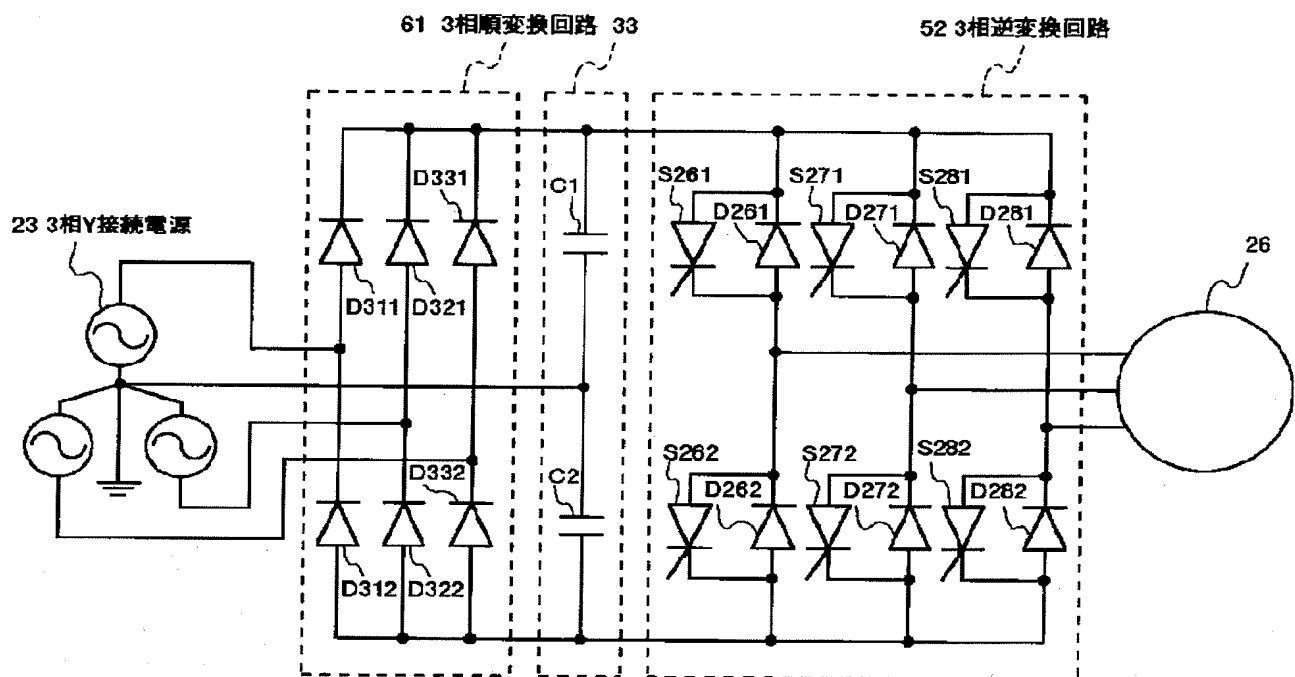
【図 4】



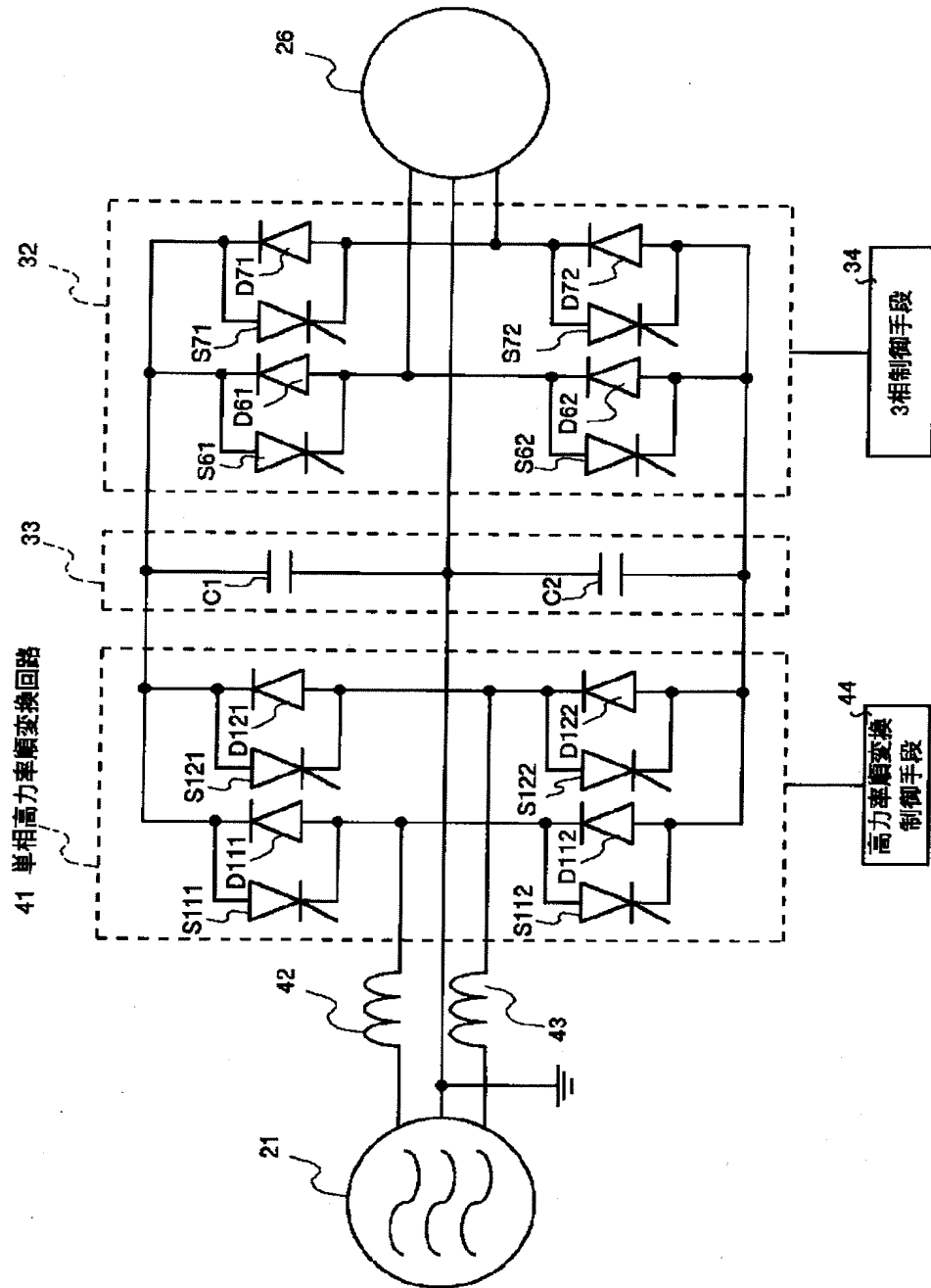
【図 1】



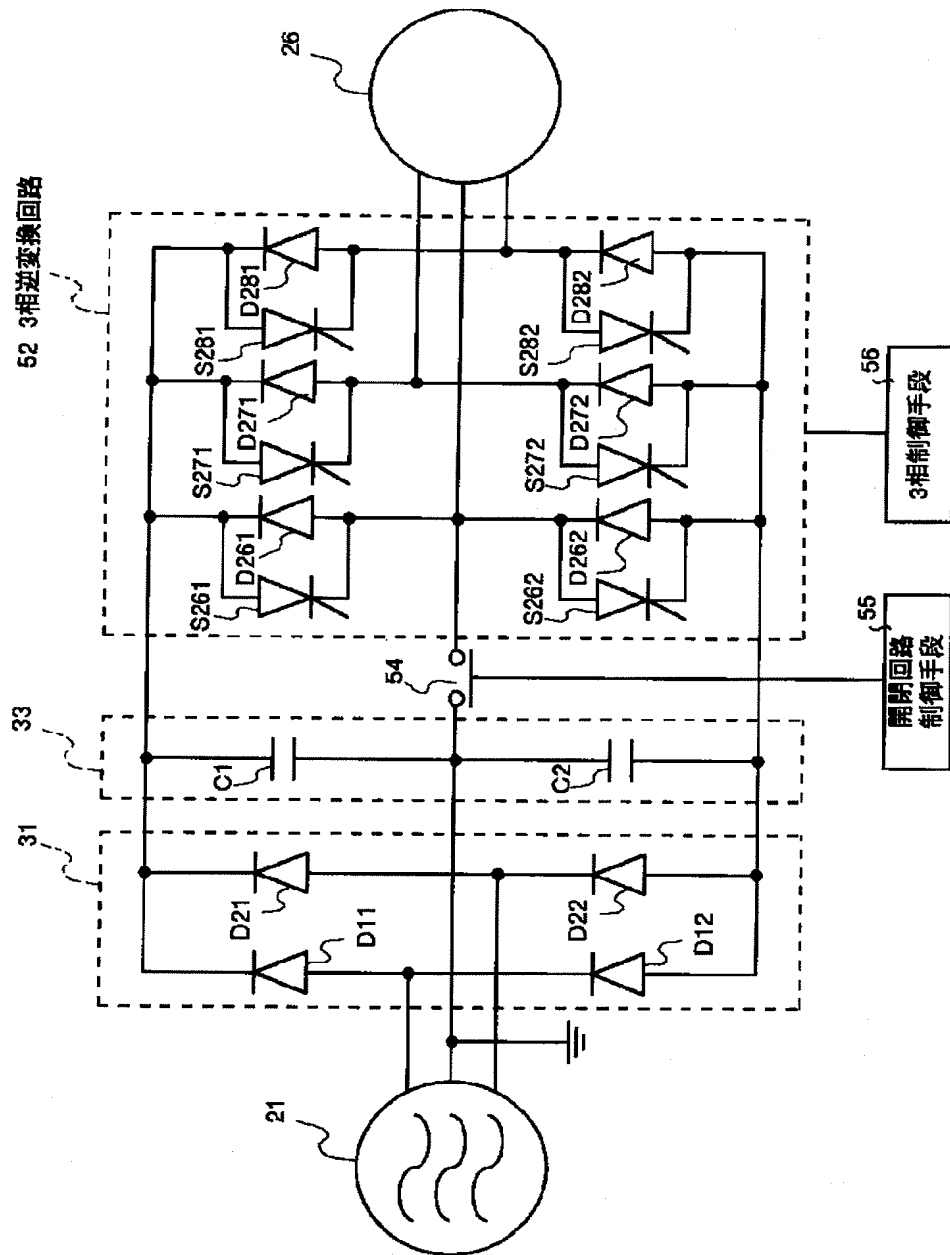
【図 9】



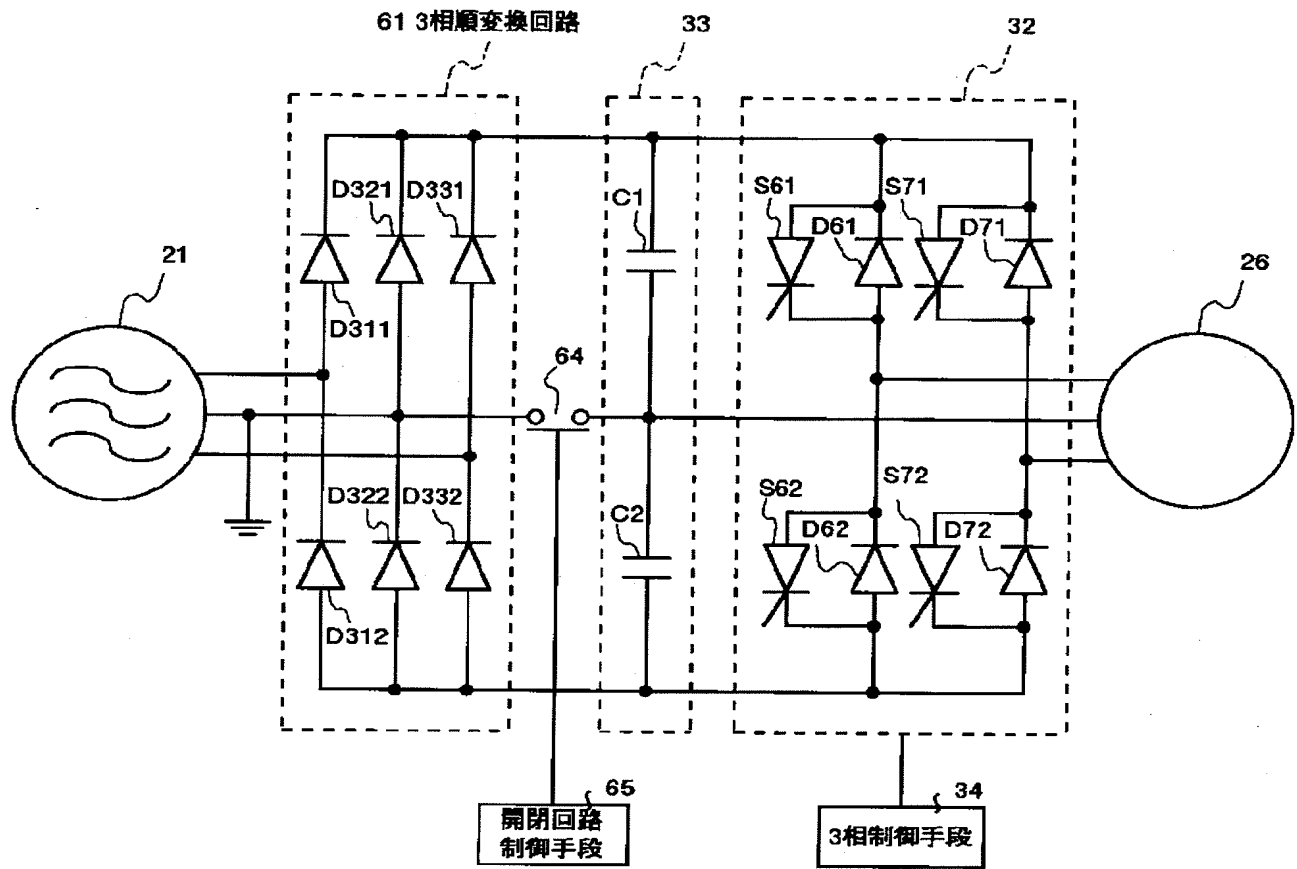
【図 2】



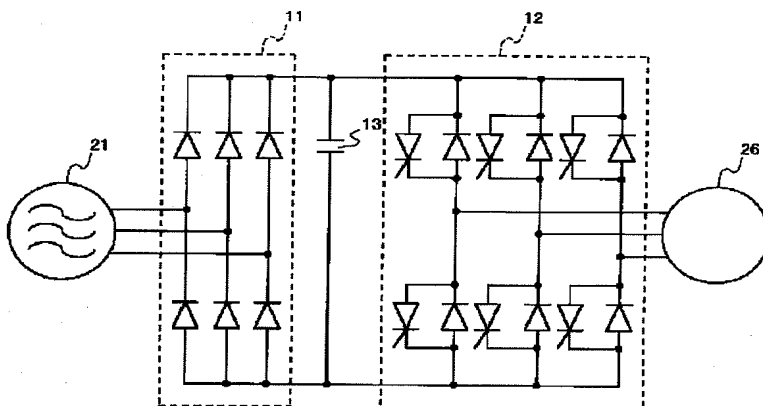
【図 3】



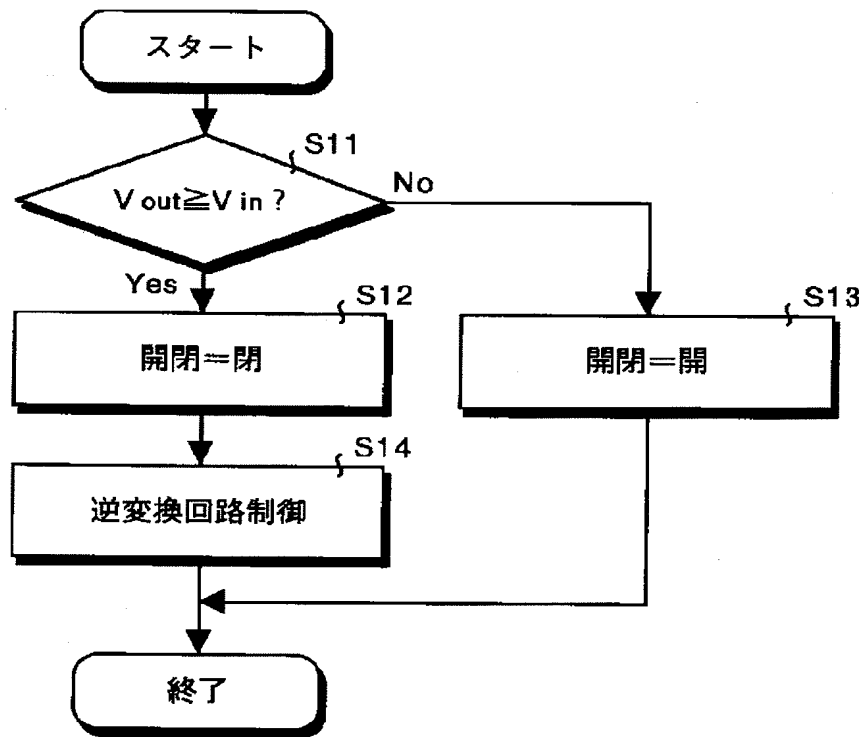
【図 5】



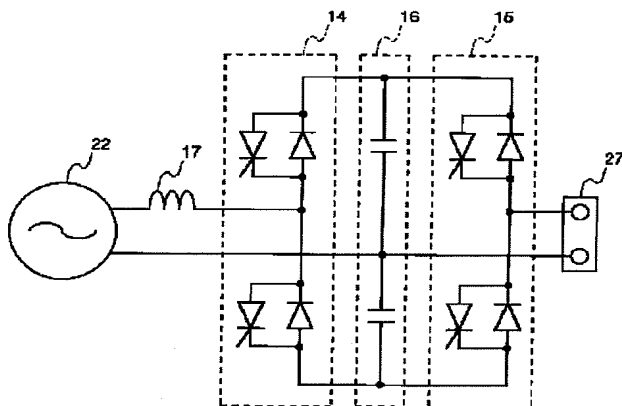
【図 11】



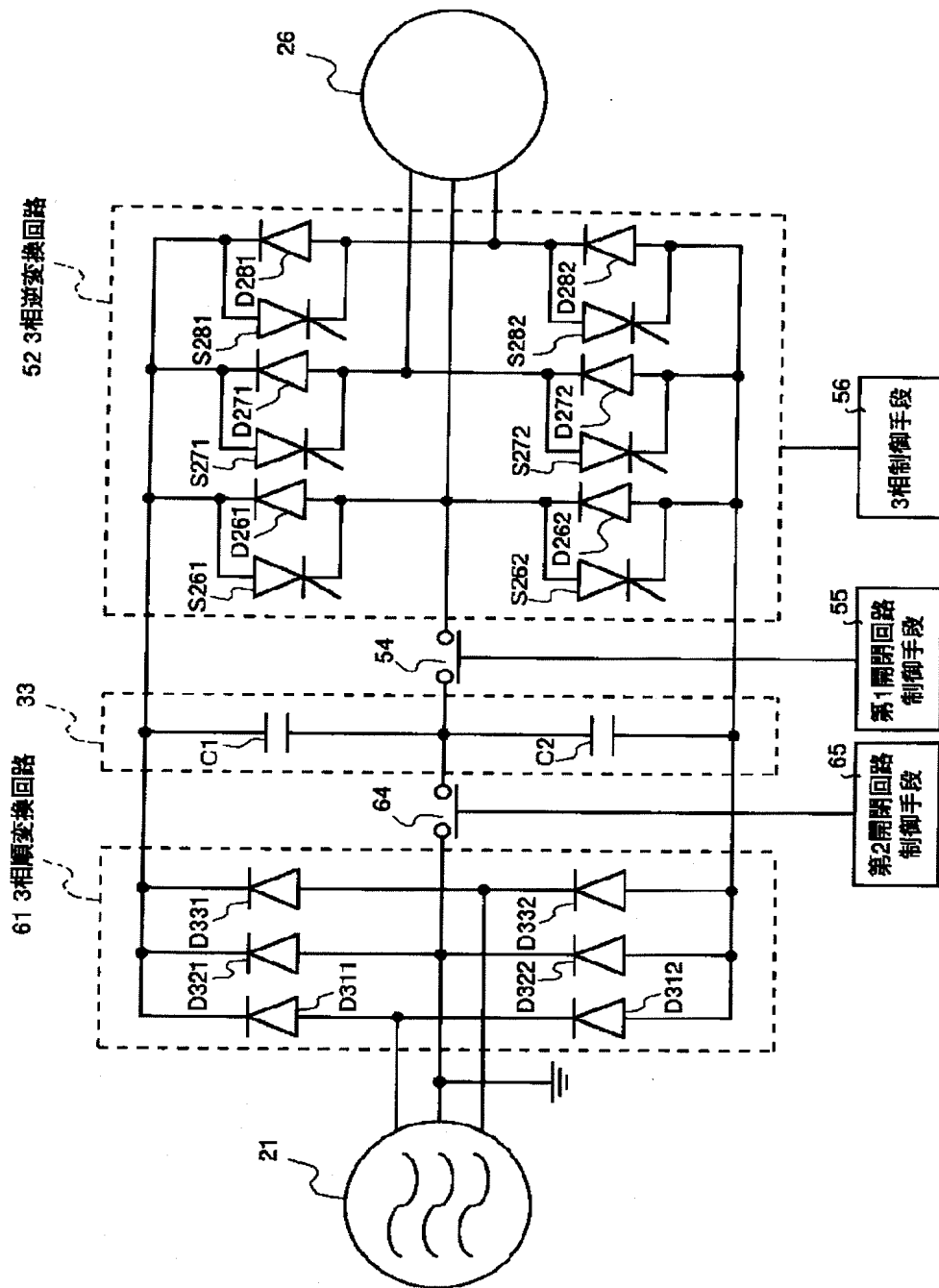
【図 6】



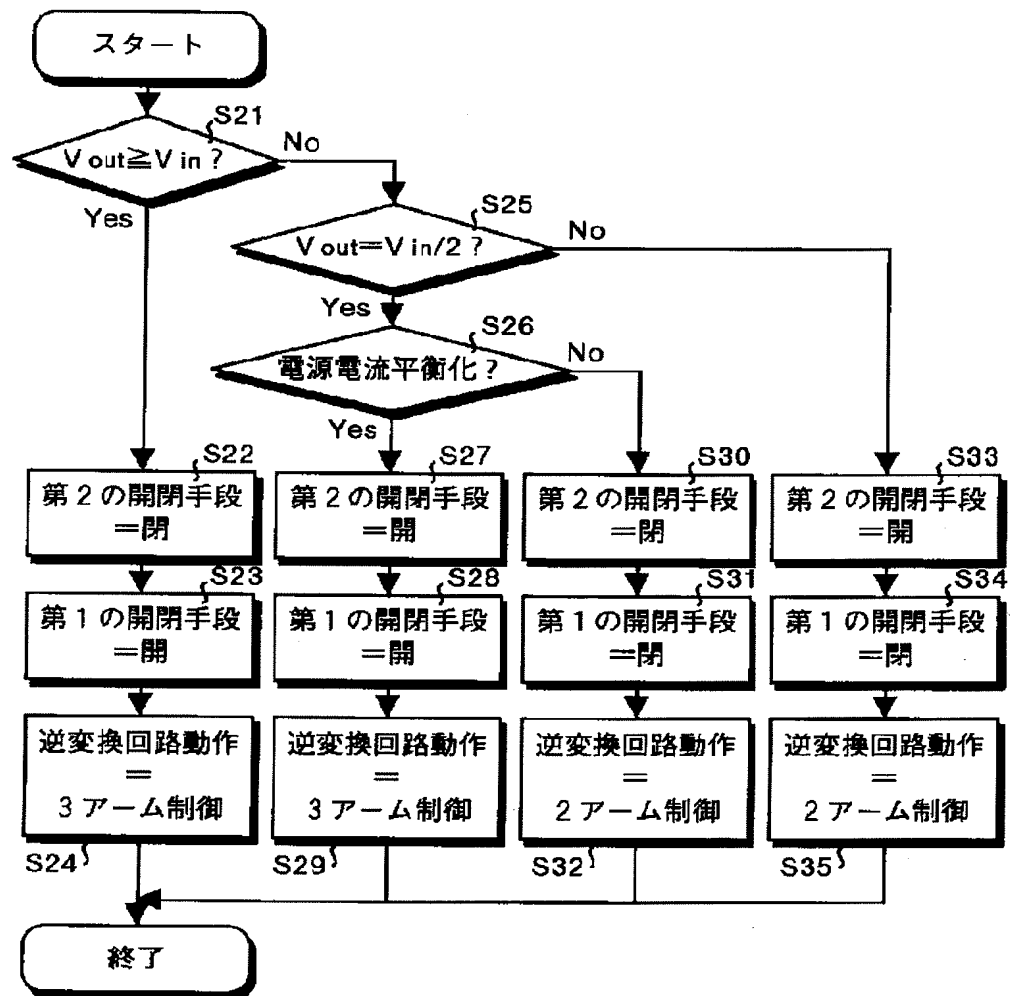
【図 12】



【図7】



【図 8】



【図10】

